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FINAL ENVIRONMENTAL IMPACT STATEMENT, DREDGE RIVER CHANNEL: NAV--ETC(U)
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6. COMMENTS REQUESTED: (continued)

FINAL

SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND

'DREDGE RIVER CHANNEL'

NAVAL SUBMARINE BASE NEW LONDON,

GROTON, CONNECTICUT

VOLUME 1

SEPTEMBER 1976

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This document supplements the FEIS ~~by~~ not only by describing continuing dredging requirements of the Navy to insure the successful introduction of the new deep-draft SSN 688 class submarines at the U. S. Naval Submarine Base, but also by correcting deficiencies noted in the decision of the United States Circuit Court of Appeals in National Resources Defense Council et al. v. Callaway et al. (2nd Cir. No. 75-7048) dated September 9, 1975. Navy dredging requirements in

(cont on p 1473 B)

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support of the SSN 688 class submarines are projected over a ten year period. Four segments of the required dredging described under this action are required immediately and are scheduled to commence in 1976. These segments are:

(1) Continuation of the deepening and selective widening of an existing navigation channel from the Gold Star Memorial Bridge to the Naval Submarine Base, Station 0+00 (1,292,000 cubic yards).

(2) Dredging (195,000 cubic yards) of a channel extension approximately 533 feet in length and 740 feet in width contiguous to and north of Thames River Channel station 0+00 as delineated in the Final Environmental Impact Statement Dredge River Channel, New London, Groton, Connecticut previously filed.

(3) Dredging (514,000 cubic yards) of specified berthing areas to depth of -39 feet (MLW) plus 1 foot of overdredge.

(4) Dredging (160,000 cubic yards) of a specified area to -59 feet (MLW) plus one foot overdredge in order to accommodate a new floating drydock (ARDM) facility. This new ARDM facility is a direct support requirement for the SSN 688 class submarines.

The immediate dredging requirement (1976-1977) totals an estimated 1.8 million cubic yards and is proposed for disposal at the New London Dumping Ground. An additional 1.0 million cubic yards is projected through 1985 to be disposed of at a site to be designated by the U. S. Army Corps of Engineers.

Approximately 2.8 to 2.9 million cubic yards of material would be dredged and deposited at a designated ocean disposal site. The channel and berthing improvements would assure the development of the full capabilities of the new SSN 688 class submarine. The increased channel depths in New London Harbor would benefit the local economy by increasing commercial shipping in the area. In addition, the removal of polluted sediments from the Thames River would serve to enhance the commercial fishery by increasing the productivity of the estuary.

The monitoring studies have not detected any long or short term unacceptable adverse environmental effects as pertains to the dredging of the Thames River or spoil disposal at the New London Dumping Ground following the first increment of Navy channel dredging completed in July 1975.

These studies have shown that the effects of turbidity are short term and that the spoil deposited at the New London Dumping Ground has remained in the proximity of the disposal site. Recolonization of benthic communities has been reported.

A comprehensive review and evaluation of all available atlernatives has concluded the continued use of the New London Dumping Ground to be the most environmentally acceptable disposal site for project spoils.

DEPARTMENT OF THE NAVY

DRAFT SUPPLEMENT TO

FINAL ENVIRONMENTAL IMPACT STATEMENT "DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT"

DATED DECEMBER, 1973

VOLUME 1

"Prepared by Northern Division, Naval Facilities Engineering Command for Commander-in-Chief, U.S. Atlantic Fleet, in accordance with OPNAVINST 6240.3D in compliance with Section 102 (2)(c) of the National Environmental Policy Act of 1969"

SUMMARY

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE,

NEW LONDON, GROTON, CONNECTICUT

( ) DRAFT (X) FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT

RESPONSIBLE OFFICE: U.S. Navy, Northern Division, Naval Facilities Engineering Command, Philadelphia, Pennsylvania

1. NAME OF ACTION: (X) Administrative ( ) Legislative

2. DESCRIPTION OF ACTION: This document supplements the FEIS by not only describing continuing dredging requirements of the Navy to insure the successful introduction of the new deep-draft SSN 688 class submarines at the U.S. Naval Submarine Base, but also by correcting deficiencies noted in the decision of the United States Circuit Court of Appeals in National Resources Defense Council et al. v. Callaway et al. (2nd Cir. No. 75-7048) dated September 9, 1975. Navy dredging requirements in support of the SSN 688 class submarines are projected over a ten year period. Four segments of the required dredging described under this action are required immediately and are scheduled to commence in 1976. These segments are:

(1) Continuation of the deepening and selective widening of an existing navigation channel from the Gold Star Memorial Bridge to the Naval Submarine Base, Station 0+00 (1,292,000 cubic yards).

(2) Dredging (195,000 cubic yards) of a channel extension approximately 533 feet in length and 740 feet in width contiguous to and north of Thames River Channel station 0+00 as delineated in the Final Environmental Impact Statement Dredge River Channel, New London, Groton, Connecticut previously filed.

(3) Dredging (514,000 cubic yards) of specified berthing areas to a depth of -39 feet (MLW) plus 1 foot of overdredge.

(4) Dredging (160,000 cubic yards) of a specified area to -59 feet (MLW) plus one foot overdredge in order to accommodate a new floating drydock (ARDM) facility. This new ARDM facility is a direct support requirement for the SSN 688 class submarines.

The immediate dredging requirement (1976-1977) totals an estimated 1.8 million cubic yards and is proposed for disposal at the New London Dumping Ground. An additional 1.0 million cubic yards is projected through 1985 to be disposed of at a site to be designated by the U. S. Army Corps of Engineers.

3. ENVIRONMENTAL IMPACT: Approximately 2.8 to 2.9 million cubic yards of material would be dredged and deposited at a designated ocean disposal site. The channel and berthing improvements would assure the development of the full capabilities of the new SSN 688 class submarine. The increased channel depths in New London Harbor would benefit the local economy by increasing commercial shipping in the area. In addition, the removal of polluted sediments from the Thames River would serve to enhance the commercial fishery by increasing the productivity of the estuary.

4. ADVERSE ENVIRONMENTAL EFFECTS: The on-going monitoring studies have not detected any long or short term adverse environmental effects as pertains to the dredging of the Thames River or spoil disposal at the New London Dumping Ground during the first increment of Navy channel dredging which commenced in July 1974.

These studies have shown that the effects of turbidity are short term and that approximately 95% of the spoil deposited at the New London Dumping Ground has remained in the proximity of the disposal site. Recolonization of benthic communities has been reported.

5. ALTERNATIVES: The following alternatives to dredging and spoil disposal have been reconsidered here in accordance with the state-of-the-art:

a. Do Nothing.

b. Alternative Dredging Techniques.

c. Alternative Transport Systems.

d. Alternative Dredge Spoil Disposal Techniques.

(1) Spoil Upgrading
(2) Beach Nourishment
(3) Sanitary Landfill Cover
(4) Strip Mine Reclamation
(5) Construction Material
(6) Water Front Disposal
(7) Diked Land Disposal
(8) Island Building
(9) Container Disposal
(10) Marsh Building
(11) Subaqueous Borrow Pits.

5. Alternatives: (continued)

(12) Potential Land Disposal Sites.

(a) State Hospital Sites
(b) Dow Chemical Site
(c) Horton Cove Site
(d) Hempstead Farms Site
(e) U.S. Coast Guard Academy Site
(f) Fort Trumbull Site
(g) Trumbull Airport Site

(13) Ocean Disposal Sites

(a) Cornfield Shoals
(b) Orient Point
(c) Niantic
(d) New London
(e) Dispersal Site 1
(f) Dispersal Site 2
(g) Containment Site 1
(h) Containment Site 2
(i) Containment Site 3
(j) East Hole
(k) Rhode Island Sound Site
(l) Browns Ledge
(m) Munitions Site
(n) Acid Barge Site

A comprehensive review and evaluation of all available alternatives has concluded the continued use of the New London Dumping Ground to be the most environmentally acceptable disposal site for project spoils.

6. COMMENTS REQUESTED:

FEDERAL:

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6. COMMENTS REQUESTED: (continued)

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6. COMMENTS REQUESTED: (continued)

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6. COMMENTS REQUESTED: (continued)

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Member: Dr. Gerald Pesch, National Marine Water Quality Lab, FWPCA, EPA, South Ferry Road, Narragansett, RI 02882

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6. COMMENTS REQUESTED: (continued)

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Town Manager, Town Hall, 45 Fort Hill Road, Groton, CT 06340

Chairman, Joint Committee on Environment, Nate Whipple Highway, Cumberland, RI 02864

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Environmental Defense Fund, Inc., 162 Old Town Road, East Setauket, NY 11733

The Long Island Sound Task Force, 50 West 40 Street, New York, NY 10018

The Fisher's Island Civic Association, Inc., Fisher's Island, NY 06390

The Fisher's Island Lobstermen's Association, Inc., Fisher's Island, NY 06390

North Fork Environmental Council, Inc., Box 311, Southold, NY 11971

The League of Women Voters of Riverhead - Southold, Box 1103, Southold, NY 11971

Connecticut Citizen Action Group (CCAG), 57 Farmington Avenue, Hartford, CT 06105

President, National Audubon Society, Inc., 950 Third Avenue, New York, NY 12168

Connecticut Wildlife Federation, Inc., 438 Main Street, P.O. Box 7, Middletown, CT 06457

Sierra Club - Connecticut Chapter, P.O. Box 111, New London CT 06320

New England Natural Resources Center, 506 Statler Office Building, Boston, MA 02116

6. COMMENTS REQUESTED: (continued)

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Environmental Action Fund, P.O. Box 312, Guilford, CT 06437

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Thames Science Center, Gallows Lane, New London, CT 06320

Housatonic Valley Association, Inc., Route 7, Kent, CT 06757

Save Our State Committee, Inc., Box 422, Jewett City, Ct 06351

Save The Bay, Inc., 655 Main Street, East Greenwich, RI 02818

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Point Judith Fisherman's Association, Galilee Road, Point Judith, RI

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6. COMMENTS REQUESTED: (continued)

PRIVATE ORGANIZATIONS AND INDIVIDUALS: (continued)

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Mr. C. D. Hardy, Marine Sciences Research Center, Building J., SUNY, Stony Brook, NY 11790

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Dr. H. B. O'Connors, Marine Sciences Research Center, Building J., SUNY, Stony Brook, NY 11790

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Dr. R. E. Wilson, Marine Sciences Research Center, Building J., SUNY, Stony Brook, NY 11790

Dr. C. F. Wurster, Marine Sciences Research Center, Building J., SUNY, Stony Brook, NY 11790

Dr. M. J. Bowman, Marine Sciences Research Center, Building J., SUNY, Stony Brook, NY 11790

Dr. G. C. Williams, Department of Ecology and Evolution, Graduate Biology Building, SUNY, Stony Brook, NY 11790

7. DRAFT SUPPLEMENT FILED:

(1) April 22, 1976 - Submitted to the Council on Environmental Quality.

(2) April 30, 1976 - Notice of Availability; Federal Register (41 Fed. Reg. 18136).

SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT

NAVAL SUBMARINE BASE

NEW LONDON, GROTON, CONNECTICUT

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VOLUME 2

SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT

NAVAL SUBMARINE BASE

NEW LONDON, GROTON, CONNECTICUT

1. INTRODUCTION

1.01 PURPOSE. This supplement to Final Environmental Impact Statement, "Dredge River Channel, Naval Submarine Base, New London, Groton, Connecticut, dated December 1973 (hereinafter referred to as FEIS, ref. 248), has been prepared by the Department of the Navy in accordance with existing directives to satisfy requirements of the National Environmental Policy Act of 1969 (PL 89-665) and to remedy deficiencies noted in the decision of the United States Second Circuit Court of Appeals in Natural Resources Defense Council et al. v. Callaway et al. (2nd Cir. No. 75-7048) dated September 9, 1975.

1.02 Significant new information has become available concerning the environmental aspects of the action subject of the aforementioned FEIS subsequent to its filing with the Council on Environmental Quality (CEQ). This new information is being provided in accordance with the provisions of paragraph 1500.11 (b) of the CEQ Guidelines of August 1, 1973 (38 Fed. Reg. 20549).

1.03 Specifically, this Supplement will describe and evaluate the environmental effects of the required berthing area dredging mentioned in paragraph 1.06 of the FEIS as well as the effects of all other required Navy dredging and disposal in the New London area (see fig. 1-1) over the next ten years, including (1) an extension upstream

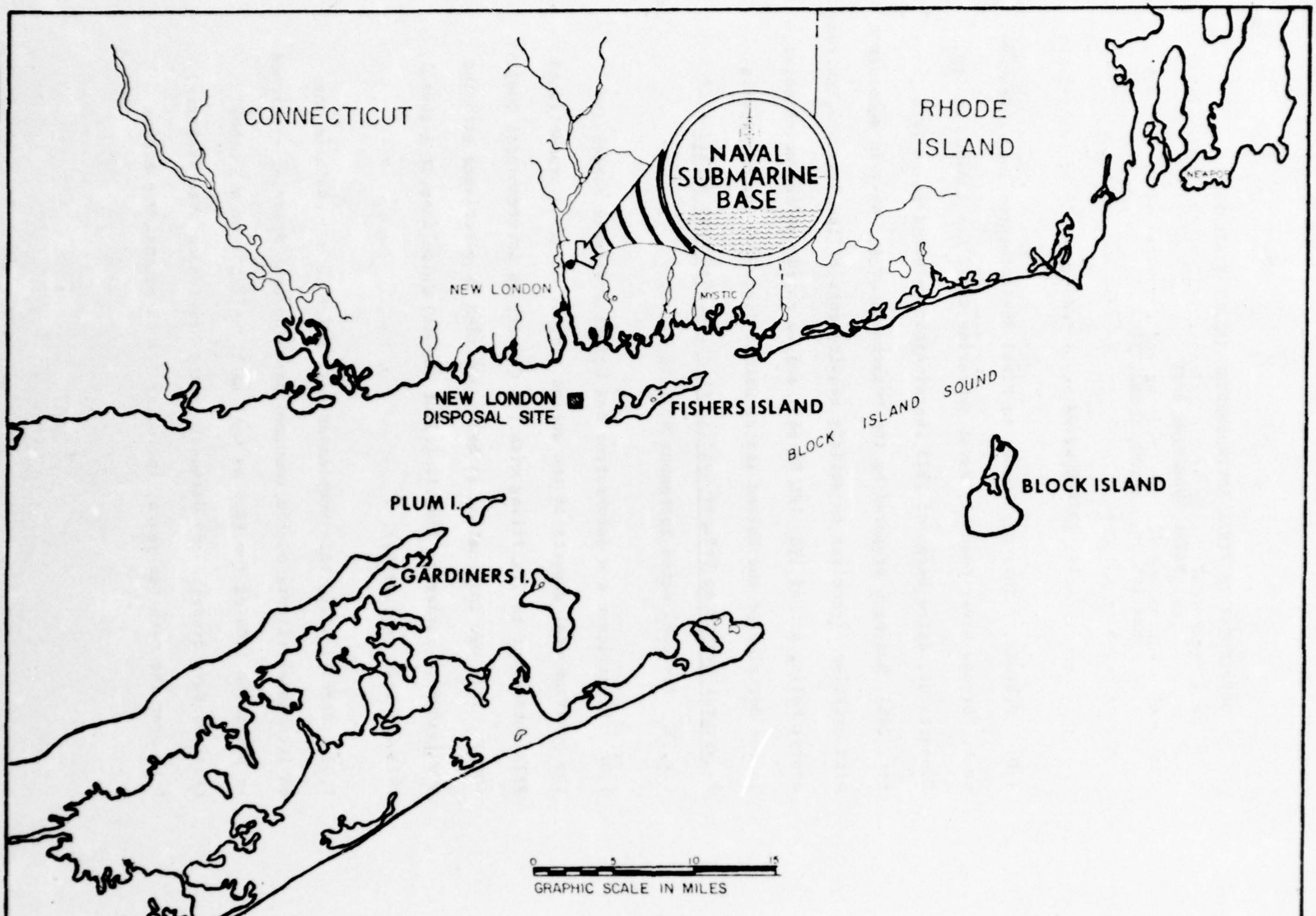

CONNECTICUT
RHODE
ISLAND
NAVAL
SUBMARINE
BASE
NEW LONDON
MYSTIC
NEW LONDON
DISPOSAL SITE
FISHERS ISLAND
BLOCK ISLAND SOUND
BLOCK ISLAND
PLUM I.
GARDINERS I.
0 5 10 15
GRAPHIC SCALE IN MILES

FIGURE 1-1

of the geographical limits of the 2nd increment of the Thames River channel dredging and (2) the dredging and disposal associated with several berthing and repair facilities removal and construction projects. Such projects have been assessed independently of the related dredging and disposal (see Appendix A) and have been determined not to have a significant impact on the environment.

1.04 As part of the environmental evaluation contained herein is an evaluation of all alternatives to the proposed action. The data presented relating to alternative ocean disposal sites and a comparison thereof has been coordinated with the Army Corps of Engineers in keeping with its responsibility for locating and specifying dredge spoil water disposal sites under Section 404 of the Federal Water Pollution Control Act (PL 92-500), and Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (PL 92-532).

1.05 No attempt is made in this supplement to present data and/or information which has already been presented in the FEIS. In those cases where a duplication of data and/or information might be of benefit in reinforcing the supplement, an appropriate reference to the FEIS is provided. Any private group or Federal agency not having the FEIS may obtain it at minimal cost from:

Order Department
National Technical Information Service
6285 Port Royal Road
Springfield, VA 22161

Order Numbers for the two volumes of the FEIS are as follows:

VOL. 1 EIS-CT-74-0077-F-1

VOL. 2 EIS-CT-74-0077-F-2

1.06 HISTORY. On January 9, 1974, The Final Environmental Impact Statement, "Dredge River Channel, Naval Submarine Base, New London, Groton, Connecticut," dated December 1973, was submitted to the Council on Environmental Quality (CEQ). This action culminated a two year program by the U.S. Navy to assess the environmental impacts associated with the dredging of nearly 3 million cubic yards of material from the Thames River in order to accommodate the new SSN 688 class of submarines. A notification of filing of the FEIS was published in the Federal Register by the Council on Environmental Quality on January 28, 1975 (30 Fed. Reg. 3584).

1.07 A permit, CT-LOND-74-63, authorizing the U.S. Navy to accomplish the Thames River dredging and designating the New London Dumping Ground as the disposal site was issued by the New England Division, Corps of Engineers on April 29, 1974. This permit contained as a special condition that a comprehensive monitoring and environmmental effects study be conducted at the dredge and disposal areas before, during and after the dredging effort.

1.08 On June 24, 1974, the environmental monitoring and effects survey at the dredge and disposal locations, Thames River channel and New London disposal site respectively, was commenced by the prime

contractor, the Middle Atlantic Coastal Fisheries Center (MACFC) of the National Oceanic and Atmospheric Administration (NOAA) to comply with the permit and has continued to date. It is the Navy's intention to continue a monitoring survey at the dredge site, the New London Dumping Ground or any other disposal site, so designated by the U.S. Army Corps of Engineers to receive the remainder of Navy project spoil material. The scope and duration of these surveys shall depend upon the conditions and criteria as set forth in the permit. Permit criteria may be subject to revision by the U.S. Army Corps of Engineers, based upon scientific knowledge as developed during the first years monitoring survey.

1.09 As required in the funded proposal, quarterly reports are prepared and submitted both to members of the Interagency Scientific Advisory Subcommittee on Ocean Dredging and Spoiling (ISASODS) and the U.S. Navy for review. The Navy in turn has distributed the Quarterly Reports and/or abstracts to numerous interested parties. As of September 1976, seven quarterly reports (table 1-1) had been prepared and submitted by MACFC. On January 16, 1976 comments concerning the content and/or scope of the Navy's first year of monitoring were invited from numerous Federal, Congressional, State and Local interests. As of this writing no comments have been received. Summaries of these seven quarterly reports (1st Increment of Channel Dredging) are presented in Appendix B. The first year's results are presented in Volume 3.

TABLE 1-1

Quarterly Report	Period	Type of Survey	MACFC Informal Report	**NTIS No.
1st	Jun, Jul, Aug, Sept 1974	Pre and Concurrent	No. 40 1 Nov. 1974	AD-A014 592/OWP
2nd	Oct, Nov, Dec 1974	Concurrent Dredging	No. 49 7 Feb. 1975	AD-A014 595/3WP
3rd	Jan, Feb, Mar 1975	Concurrent Dredging	No. 62 5 May 1975	AD-A014 596/1WP
4th	Apr, May, June 1975	Concurrent Dredging	No. 75 15 Aug. 1975	AD-A015 647/1WP
5th	July, Aug, Sept 1975	Post Dredging	No. 84 19 Nov. 1975	AD-A023 982
6th	Oct, Nov, Dec 1975	Post Dredging	No. 107 April 1976	AD-A026 347
7th	Jan, Feb, Mar 1976	Post Dredging	No. 116 August 1976	
8th	Apr, May, June 1976	Post Dredging	Final Report due October	

** Additional copies of Quarterly Reports may be obtained at minimal charge from:
Order Department, National Technical Information Service, 6285 Port Royal Road, Springfield, VA 22161

1.10 A contract for accomplishing the first increment of Thames River Channel Dredging was awarded to the low bidder, Dunbar and Sullivan Dredging Company, Dearborn, Michigan on June 26, 1974. The limits of this project which consisted of only approximately one-half of the dredging evaluated in the FEIS are indicated in figure 1-2.

1.11 The Department of the Army permit, CT-LOND-74-63, was amended on August 3, 1974 to include the criteria for use in monitoring the dredge and disposal areas. On August 14, 1974 the permit was again amended, this time to include the provision that:

> "If the monitoring program and the investigation into an approved alternate dump site reveal that it is in the best public interest to relocate the dump site, the Division Engineer shall notify the permittee that the dump site will be changed immediately."

1.12 The 1st Increment of Thames River Channel Dredging was commenced by Dunbar and Sullivan on August 19, 1974 using "bucket dredge" techniques. The intial grab dredge on-site was the "Dunbar II", a stationary barge mounting a crane and equipped with a kicking SPUD arrangement. A second dredge, the C. A. Richardson (Dredge #428), was utilized by Dunbar and Sullivan from November 19, 1974 to April 15, 1975. Dredge #428 was configured similar to Dunbar II but utilized a 10 cubic yard clamshell vice the 14 cubic yard clamshell used by Dunbar II. Transport of the dredged material from the dredge site to the permitted

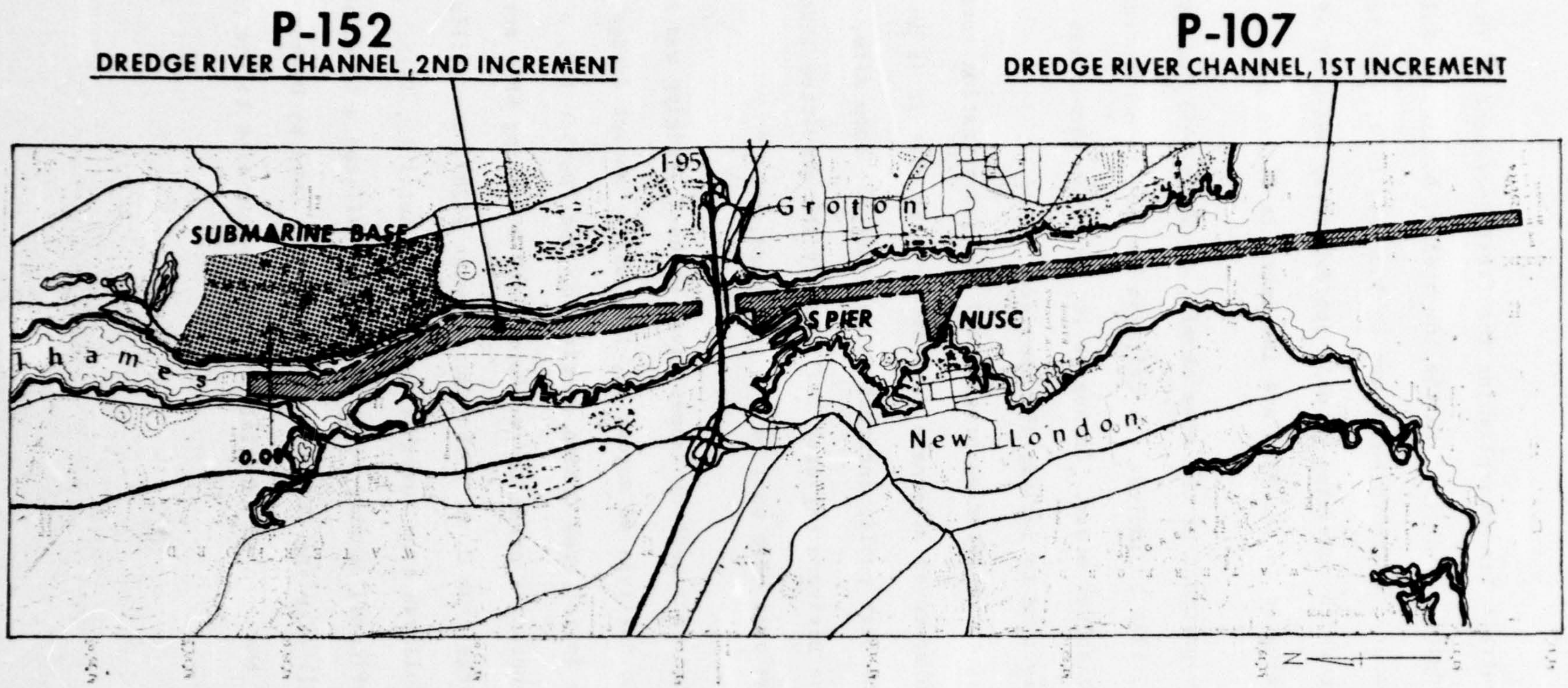

P-152
DREDGE RIVER CHANNEL ,2ND INCREMENT
P-107
DREDGE RIVER CHANNEL, 1ST INCREMENT
SUBMARINE BASE
I-95
Groton
S PIER
NUSC
Thames
New London
N

FIGURE 1-2

disposal area, the New London Dumping Ground (see fig. 1-1), was accomplished using either 1500 or 1800 cubic yard scows under tow. As was the dredging operation, dumping was monitored by an Army Corps of Engineers' inspector in accordance with the provisions of the permit, CT-LOND-74-63.

1.13 In September 1974, the Natural Resources Defense Council and other environmental and public interest groups brought suit against officials of the Department of the Army, the Department of the Navy, and the Environmental Protection Agency seeking declaratory and injunctive relief to prevent the Navy from proceeding with the dredging of the Thames River and dumping the dredged spoil at the selected New London dumping site in Long Island Sound (ref. 203). The plaintiffs alleged that the defendants violated the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816) as amended, the Rivers and Harbors Act of 1899 (33 U.S.C. 401), and the National Environmental Policy Act (PL 91-190). After hearings, a decision by Judge Blumenfeld (United States District Court, District of Connecticut) determined that the defendants had complied with the provisions of the National Environmental Policy Act. However, the District Court dismissed Plaintiffs' claim for lack of jurisdiction under the Federal Water Pollution Control Act because Plaintiffs filed suit prior ro the expiration of the 60-day waiting period required by 33 U.S.C. 1365(a).

1.14 The 1st Increment of Thames River Channel Dredging was essentially completed on June 30, 1975 although sweeping of high spots, dredging

of shoals and removal of rock occurred until July 18, 1975. The total quantity of material removed during the 1st increment of Thames River Channel Dredging operation has been estimated to be 1,499,432 cubic yards. Two areas, located immediately south of the Penn Central Railroad Bridge on the Groton side of the Thames River and originally intended to be dredged were left untouched due to the presence of dredging obstacles. These areas encompassing approximately 2300 square yards of river bottom at an average depth of 30 feet besides lying over two submerged telephone cables were found to contain concrete and timber from a previously existing bridge abuttment (ref. 41). It has been decided to leave these protrusions in place and to buoy them as a navigational hazard to the class SSN 688 submarines.

1.15 On September 9, 1975, the Second Circuit Court of Appeals reversed the lower court decision in part and remanded the case for findings under the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816), holding that jurisdiction exists under the Federal Water Pollution Control Act and that the discussion in the FEIS of other dumping projects and alternative dumpsites was inadequate under the National Environmental Policy Act. The Second Circuit directed the District Court to issue appropriate injunctive relief to prevent further dumping at the New London dumpsite until the Federal Water Pollution Control Act claim and the correction of the defects in the FEIS are resolved.

1.16 The Navy was enjoined from dumping at the "New London Site," Long Island Sound by order of the U.S. District Court of Connecticut on November 12, 1975 until various defects in the FEIS are corrected and procedural steps under NEPA are completed. On January 20, 1976, the Department of the Army permit No. CT-LOND-74-63 issued to the Navy on April 29, 1974 was suspended by the New England Division, Corps of Engineers.

1.17 The Draft Supplement to the Final Environmental Impact Statement was submitted to the Council on Environmental Quality on 22 April 1976 and subsequently to agencies and public groups listed in the Summary, Volume I, for comment. Notice of the availability of the Draft Supplement was filed in the Federal Register of April 30, 1976 (41 Fed. Reg. 18136). After appropriate notice, joint Army/Navy public meetings, were held in Southold, New York and Groton, Connecticut on 9 and 10 June 1976 respectively. Transcripts of hearings, review comments and responses to comments are presented in Volume II, as well as an analysis of how this Supplement satisfies the concerns of the Second Circuit Court of Appeals in Natural Resources Defense Council et al. v. Callaway et al. (2nd Cir. No. 75-7048) dated September 9, 1975.

1.18 The Electric Boat construction schedule for 688 Class submarines has slipped primarily due to a prolonged labor strike. As a result, the first EB Division SSN 688 Class submarine will be delivered approximately nine months later than earlier scheduled. Considering this slippage, it is now estimated that the channel dredging should be completed by October 1977 to support operation of the SSN 688 Class submarines from the Submarine Base.

2. PROJECT DESCRIPTION

2.01 BACKGROUND. The mission of the Naval Submarine Base (NAVSUBASE), New London and tenant activities includes provisions for the berthing, maintenance and repair of submarines for the U.S. Atlantic Fleet. In order to fulfill the future requirements of this mission especially as pertains to the introduction of the SSN 688 class Submarines into the New London area, the U.S. Navy is planning major construction efforts in the waterfront area of NAVSUBASE. Beginning from the southernmost facility (figs. 2-1, 2-2), it is proposed that existing Pier 1 and the marine railway be removed and a replacement pier be constructed. Piers 3 and 9 will be removed and Pier 8 will be replaced. Pier 14 will be removed and Pier 15 will be modified for use in conjunction with a new submarine lifting facility. New Piers 32 and 33, and at the far North end of the Base, a new weapons-loading pier will be constructed.

2.02 These proposed changes to the waterfront at NAVSUBASE are discussed briefly in a Draft Environmental Impact Statement titled "Naval Submarine Base, New London, Groton, Connecticut" (hereinafter referred to as MASTER PLAN DEIS) which was submitted to CEQ and provided for comment to interested individuals, organizations and agencies on June 17, 1974 (ref. 252). As of this writing, this document which presents the overall impact of a chain of projects contemplated for accomplishment at the Naval Submarine Base, New London is in the final stage of preparation for submission to CEQ as a Final Environmental Impact Statement.

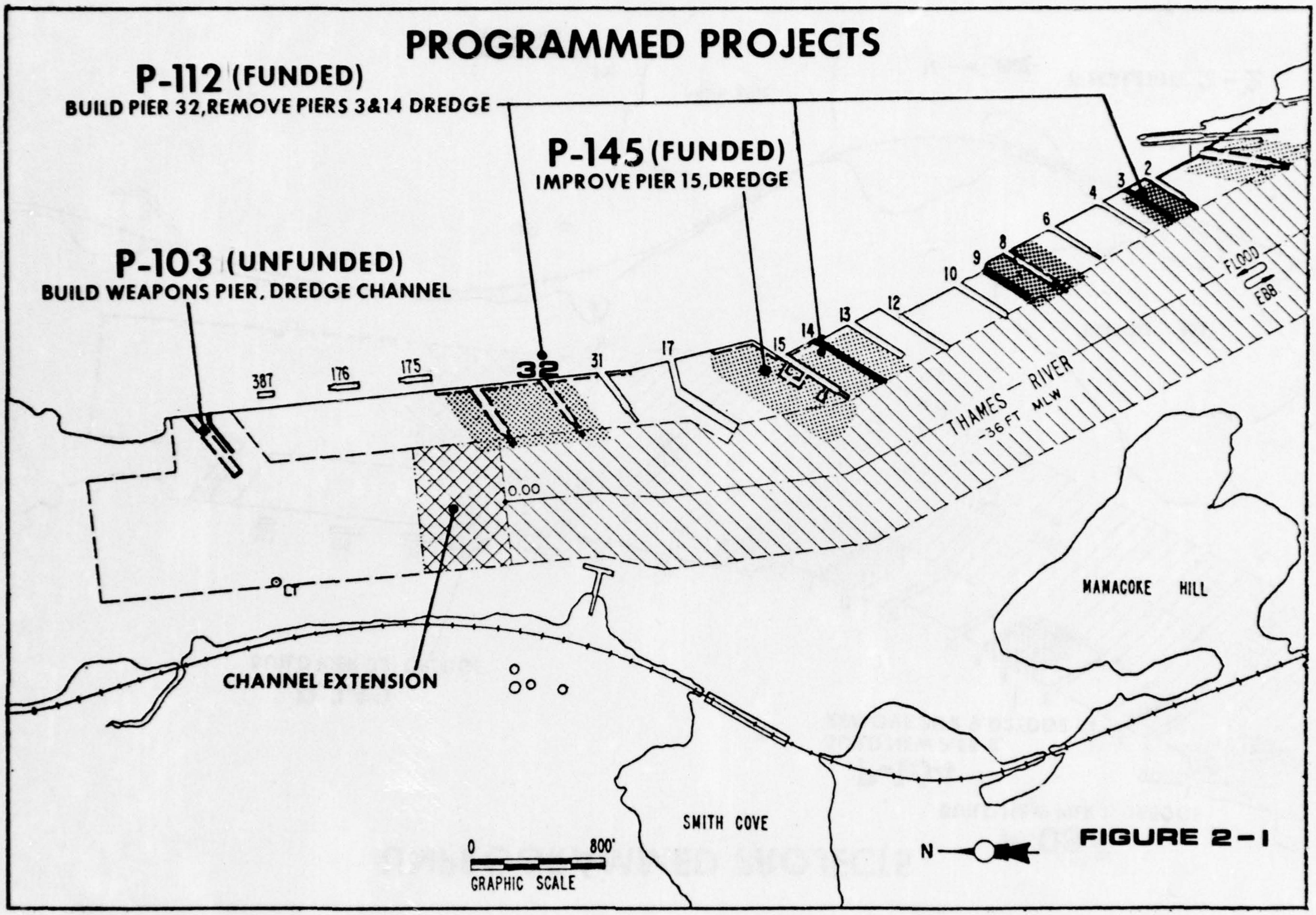
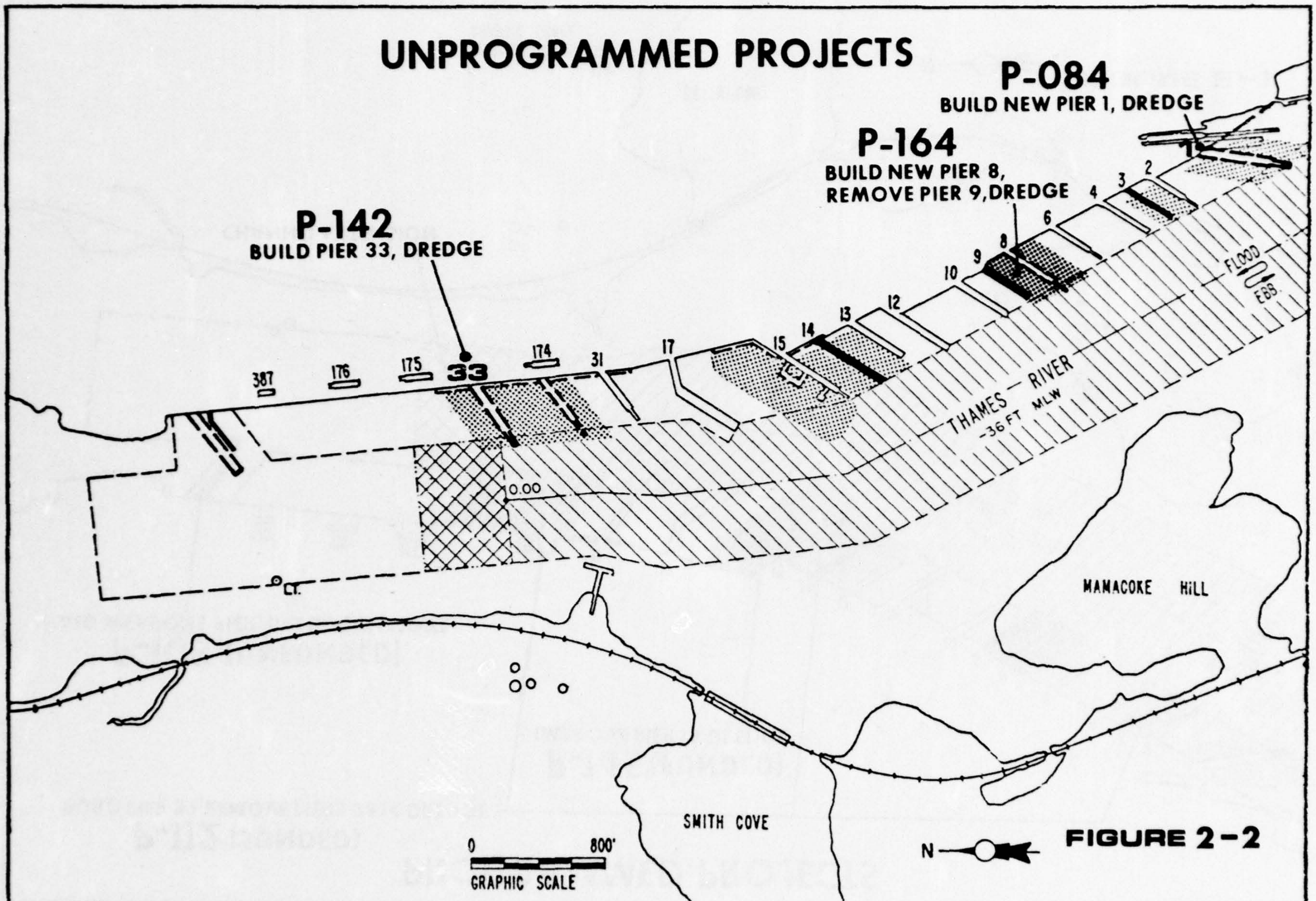

PROGRAMMED PROJECTS
P-112 (FUNDED)
BUILD PIER 32, REMOVE PIERS 3&14 DREDGE
P-145 (FUNDED)
IMPROVE PIER 15, DREDGE
P-103 (UNFUNDED)
BUILD WEAPONS PIER, DREDGE CHANNEL
2
3
4
6
8
9
10
12
13
14
15
17
31
32
175
176
387
FLOOD
EBB
THAMES — RIVER
-36 FT MLW
0.00
CT
CHANNEL EXTENSION
MAMACOKE HILL
SMITH COVE
0
800'
GRAPHIC SCALE
N

FIGURE 2-1


UNPROGRAMMED PROJECTS
P-084
BUILD NEW PIER 1, DREDGE
P-164
BUILD NEW PIER 8,
REMOVE PIER 9, DREDGE
P-142
BUILD PIER 33, DREDGE
387
176
175
33
174
31
17
15
14
13
12
10
9
8
6
4
3
2
1
FLOOD
EBB
THAMES RIVER
-36 FT MLW
0.00
C.T.
MAMACOKE HILL
SMITH COVE
0
800'
GRAPHIC SCALE
N
FIGURE 2-2

2.03 Detailed scopes and environmental impact assessments for the Military Construction Projects developed to execute these vital and necessary waterfront changes are provided in Appendix A. As indicated in paragraph 1.03, the major action to be addressed herein is the dredging associated with the aforementioned projects.

2.04 PROGRAMMED NEW DREDGING. New dredging associated with Navy Military Construction Projects, now either funded, or unfunded but programmed i.e., proposed by the Navy for Congressional authorization and funding during specific fiscal years, will involve (see fig. 2-1): (a) dredging the new Pier 32 area and unobstructed areas remaining after removal of existing Piers 3 and 14 to a new depth of -39 feet (MLW) with 1 foot overdredge, requiring an estimated removal of approximately 204,000 cubic yards of material; (b) dredging a drydock basin at existing Pier 15 for the ARDM from the present depth of -35 feet (MLW) to -59 feet (MLW) plus 1 foot overdredge necessitating the removal of approximately 154,000 cubic yards of material; (c) dredging a channel extension approximately 533 feet in length and 740 feet in width contiguous to and north of Thames River channel dredging station 0 + 00 as delineated in the FEIS; this area will be dredged to a depth of -36 feet (MLW) plus 1 foot overdredge requiring the removal of approximately 195,000 cubic yards of material. It is anticipated that all of the above mentioned dredging will be commenced during 1976 or soon thereafter.

2.05 Tentatively planned for commencement in 1980 is new dredging which will involve: (a) dredging a channel extension approximately 2000 feet in length and 740 feet in width contiguous to and north of the area described in 2.04 (c) above; the first 1500 feet of this extension will be dredged to a depth of -39 feet (MLW) plus 1 foot overdredge; the remaining 500 feet, to be used as a silting basin, will be dredged to a depth of -46 feet (MLW); this channel extension project will require the removal of approximately 615,000 cubic yards of material; (b) dredging areas adjacent to a new Weapons Pier to a depth of -39 feet (MLW) with 1 foot overdredge requiring a removal of approximately 120,000 cubic yards of material.

2.06 UNPROGRAMMED NEW DREDGING. The Navy also proposes new dredging which is today unprogrammed (see fig. 2-2) that will consist of dredging areas adjacent to replacement Pier 1, new Piers 8 and 33, and the unobstructed area remaining after removal of Pier 9 to a depth of -39 feet (MLW) plus 1 foot overdredge; this dredging effort will result in the removal of approximately 190,000 cubic yards of material.

2.07 MAINTENANCE DREDGING. The Naval Submarine Base has an immediate maintenance dredging requirement of approximately 53,000 cubic yards. This dredging is necessary in order to maintain control depths in berthing areas adjacent to existing piers as indicated in figure 2-3. From historical data, it is predicted that maintenance dredging in the amount of 150,000 cubic yards is necessary every five years. It is expected that with the dredging of a silting basin at the northern

MAINTENANCE DREDGING REQUIREMENTS

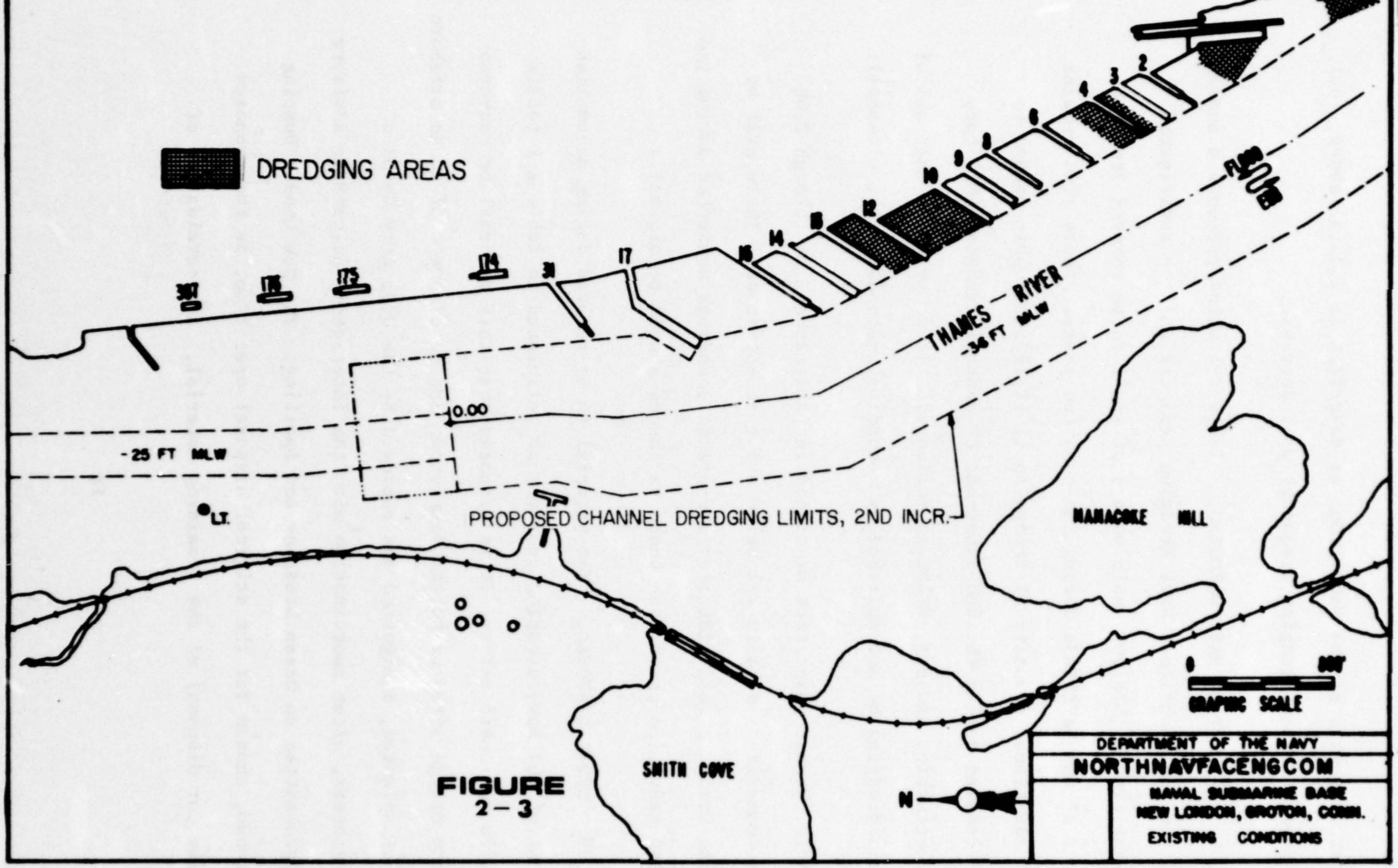


FIGURE
2-3

most extremity of the waterfront as described in 2.05(a) above, that the maintenance dredging frequency will decrease.

2.08 SUMMARY OF NAVY DREDGING. Table 2-1 below presents a summary of the aforementioned Navy dredging projects and the anticipated quantities (1,478,000 cubic yards) of spoil to be removed from the area of the NAVSUBASE during the next ten years. There also remains an additional quantity of dredge spoil (1,292,000 cubic yards) to be removed during the 2nd increment of channel dredging (Military Construction Project, P-152 is included). It is proposed that all of this dredging be accomplished by mechanical methods, i.e., clamshell.

(Note: dredge quantities mentioned in paragraphs 2.04 through 2.08 as summarized in table 2-1 below are best estimates. There will be some variance resulting from pre-dredge soundings conducted during project execution phase, but these variances should be minimal.)

2.09 SPOIL DISPOSAL. The material to be removed during accomplishment of the Navy dredging projects as delineated in table 2-1 totals 2,770,000 cubic yards. It is proposed that this material be conveyed from dredge sites by bottom dump scows and be disposed of at an offshore site selected, designated and approved by the U.S. Army Corps of Engineers, after coordination with the Interagency Scientific Advisory Subcommittee on Ocean Dredging and Spoiling. The New London Dumping Ground, chosen for the original disposal operation, is the proposed site for disposal of the remaining material. A re-evaluation of

TABLE 2-1. NAVY DREDGING PROJECTS: THAMES RIVER AND NAVAL SUBMARINE BASE.

Project #	Name	Amount	MILCON Program Year
P-152	Channel	1,292,000 cy	1976
P-152	Channel Extension	195,000 cy	1976
P-112	Pier 32	121,000 cy	1976
P-112	Pier 3	19,000 cy	1976
P-112	Pier 14	64,000 cy	1976
P-145	ARDM	154,000 cy	1976
P-103	Channel	615,000 cy	1979
P-103	Weapons Pier	120,000 cy	1979
P-164	Pier 8	80,000 cy	Unprog.(1)
P-084	Pier 1	60,000 cy	Unprog.(2)
P-142	Pier 33	50,000 cy	Unprog.(2)

(1) Anticipate 1980

(2) Anticipate 1981 or 1982

disposal methods as presented in the Section 6 of this Supplement has indicated that water disposal is the most environmentally acceptable alternative for disposing of dredge spoils originating from the New London area. Additionally, alternative sites for open water disposal were investigated. These investigations, presented in Section 6, point to the New London Dumping Ground as the appropriate site for disposal of the Navy's spoils from these projects.

3. EXISTING ENVIRONMENT OF PROPOSED SITE

3.01 DREDGING SITES, General: A wealth of information concerning the overall environmental characteristics of the Thames River, New London Harbor, etc. has been presented in the FEIS and therefore with few exceptions will not be presented in detail here. However, specific data is presented to characterize conditions at sites associated with Navy dredging projects described in paragraphs 2.04 through 2.07 above.

3.02 Water Quality: The FEIS, Section 2.03, summarizes the existing water quality data for the lower Thames River. Historically, little water quality information had been developed prior to writing the FEIS. However, these data provided the best available estimate of environmental conditions as they existed prior to commencement of dredging operations in August of 1974. The primary data sources used to develop this environmental baseline were provided by the Environmental Protection Agency (EPA), the United States Coast Guard Academy (USCGA) and a report by Gallagher and Bohlen (ref. 77).

3.03 A more substantial contribution to the environmental data base is presented in a Draft Environmental Impact Statement recently prepared by the USCGA (ref. 222). An environmental report on the Thames River Estuary by Tolderlund (ref. 202), as it appeared in this DEIS is now available as a separate publication.

3.04 Additional information has since been developed by the State of Connecticut Department of Environmental Protection (CTDEP). A

river quality station is maintained at Mohegan, Connecticut for the purpose of monitoring water quality as well as sedimend characteristics. These data are presented herein as Appendix E.

3.05 During the summers of 1974 and 1975, water quality studies were conducted by both CTDEP and Raytheon Corporation with the intent of using the data in a mathematical model being developed for the Thames River. The focus of these surveys was on an assessment of the impact of the combined sewers of Norwich and the urban runoff of the New London and Groton areas. Water quality sampling statiOns were established along the Thames River from New London Harbor to Norwich (Appendix F). In addition, stations were placed at Norwich on the Yantic and Shetucket river tributaries to the Thames River. Point sources were also sampled, including the Norwich wastewater treatment plant, and the Pfizer Chemical Company. The studies were initiated during a period of low fresh water runoff to the river in order to minimize the effects of dilution and maximize the effects of point source discharges. Surface water grab samples were collected at specified intervals and tidal cycles during the sampling period and analyzed for chemical and biological constituents.

3.06 It is difficult to derive conclusions based on short term surveys due to the complexities of the estuarine environment. The total effects of salt stratification on the vertical distribution of the various chemical constituents in the water column cannot be evaluated using surface water grab samples. Tolderlund (ref. 202) presents data which

exemplifies the chemical and physical stratification existing in the Thames River.

3.07 The less saline fresh water of lower density tends to overflow the heavier saline water forming a salt wedge. Data gathered by Gallagher and Bohlen (ref. 77) lends support to the existence of a salt wedge in the Thames River. Whitworth et al. (ref. 48) have shown the effects of a salt wedge 24 km from the mouth of the river. It is this phenomenon that may justify a surface water grab sample as being partially representative of the fresh water input to the river. In effect, the data from the CTDEP studies show the impact of the Norwich Sewage Treatment Plant on the Thames River. The high concentrations of total and fecal coliforms at sampling stations immediately below Norwich are noted. These concentrations are observed to decrease at downstream stations probably due to dilution.

3.08 Jason M. Cortell and Associates under contract to CTDEP has designed and implemented a biological monitoring program which will enable the State of Connecticut to comply with the biological monitoring requirements of Section 106(e) of the Federal Water Pollution Control Act Admendments of 1972. The CTDEP identified thirty (30) biologically productive stations. Two such stations are located in the Thames River, one at Mohegan, Connecticut, and one in New London Harbor. An interim report (ref. 105) summarizing the first year's data has been prepared.

3.09 Two ecological evaluations of the Thames River estuary were conducted in the vicinity of the Montville Power Station by the Northeast Utilities Service Company (refs. 101, 116). The studies were undertaken for the Connecticut Power and Light Company in order to evaluate entrainment of organisms and thermal effects of the Montville Power Station on the Thames River. These studies add significant data to the biological baseline for the portion of the river proximate to the Montiville Power Station. Both studies allude to the polluted conditions of the river and suggest possible municipal and industrial sources.

3.10 The latest and most comprehensive contribution to the baseline fisheries inventory of the upper Thames River watershed has recently been published by the CTDEP. "This report includes predictions of anadromous fish runs, comparisons of various habitat types, investigation and monitoring of pollution, its effect on fish in the aquatic environment and a survey of the various pathogens present in the fish population (ref. 48)."

3.11 According to Whitworth et al. (ref. 48) "a fishery exists for bluefish, Atlantic mackeral, Atlantic tomcod, striped bass, winter flounder, white catfish, American eel, rainbow smelt, alewife, and white perch in the Thames estuary from Stoddard Hill to Norwich." Whitworth and Goldstein (ref. 48) indicated that the growth potential for fish in the Thames River Estuary is good. However, it was also

reported that "the abatement of point source discharges should theoretically increase the productivity of residents at all taxonomic levels."

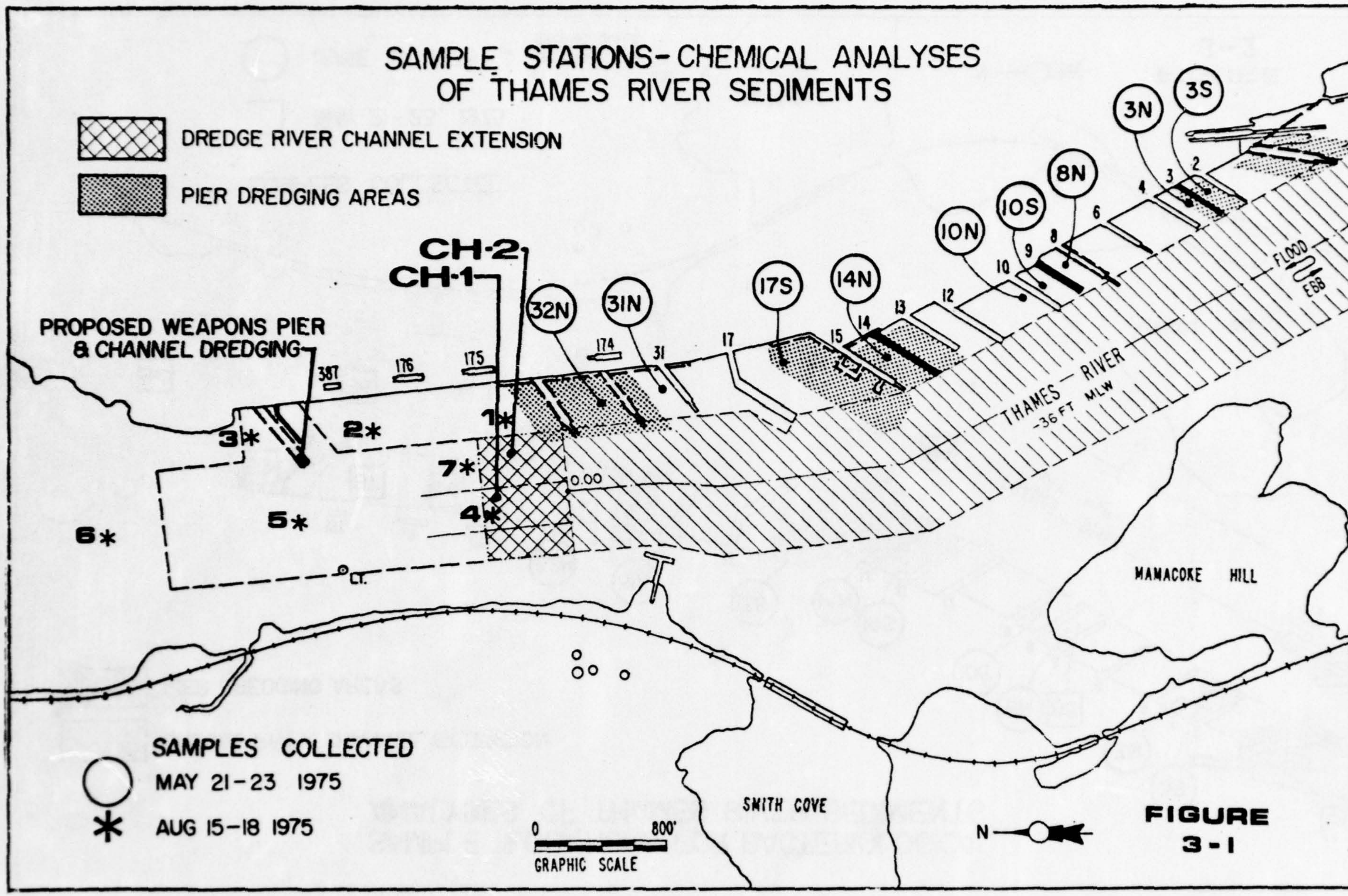
3.12 Pollution sources may be a contributing factor to the incidence of fish disease in the estuary. Wolke (ref. 48) conducted a comprehensive survey of fish diseases incident to the Thames River watershed. Wolkes' study is a step forward toward establishing a pathological baseline of information as to types of diseases, etiologic agents and incidence of disease in the Thames River. Wolke's study will aid investigators responsible for making assessments of the effects of dredging and its relationship to fish diseases in the river and at selected dredge spoiling sites. Further studies are required, to determine if a relationship exists between fish diseases and specific pollution sources.

3.13 Information supplied by the Environmental Protection Agency identifies 150 applications for permits to discharge to the Thames River watershed; of these discharges, 24 are classified as major (Appendix G). Of seven discharges which are Federal, six may be attributed to the Navy. Four of the Navy discharges represent domestic sewage receiving primary treatment and originating from the NAVSUBASE and Navy housing. A fifth discharge from the NAVSUBASE, the boiler blowdown from the power plant, is to be tied into the sanitary sewer system. The compliance schedule set forth in each of these EPA permits requires that the sanitary sewer system from the NAVSUBASE be tied into Groton sewage treatment plant sometime during fiscal year 1977.

3.14 As part of the monitoring program accomplished by NOAA, additional baseline information was gathered from the Thames River prior to commencing the 1st increment of channel dredging on August 18, 1974. An interim monitoring report (Appendix B) summarizes the first four quarterly monitoring reports and assesses the effects of dredging to date. It concludes that the monitoring study has not detected any unacceptable adverse environmental effects in the Thames River which may be attributed to the dredging.

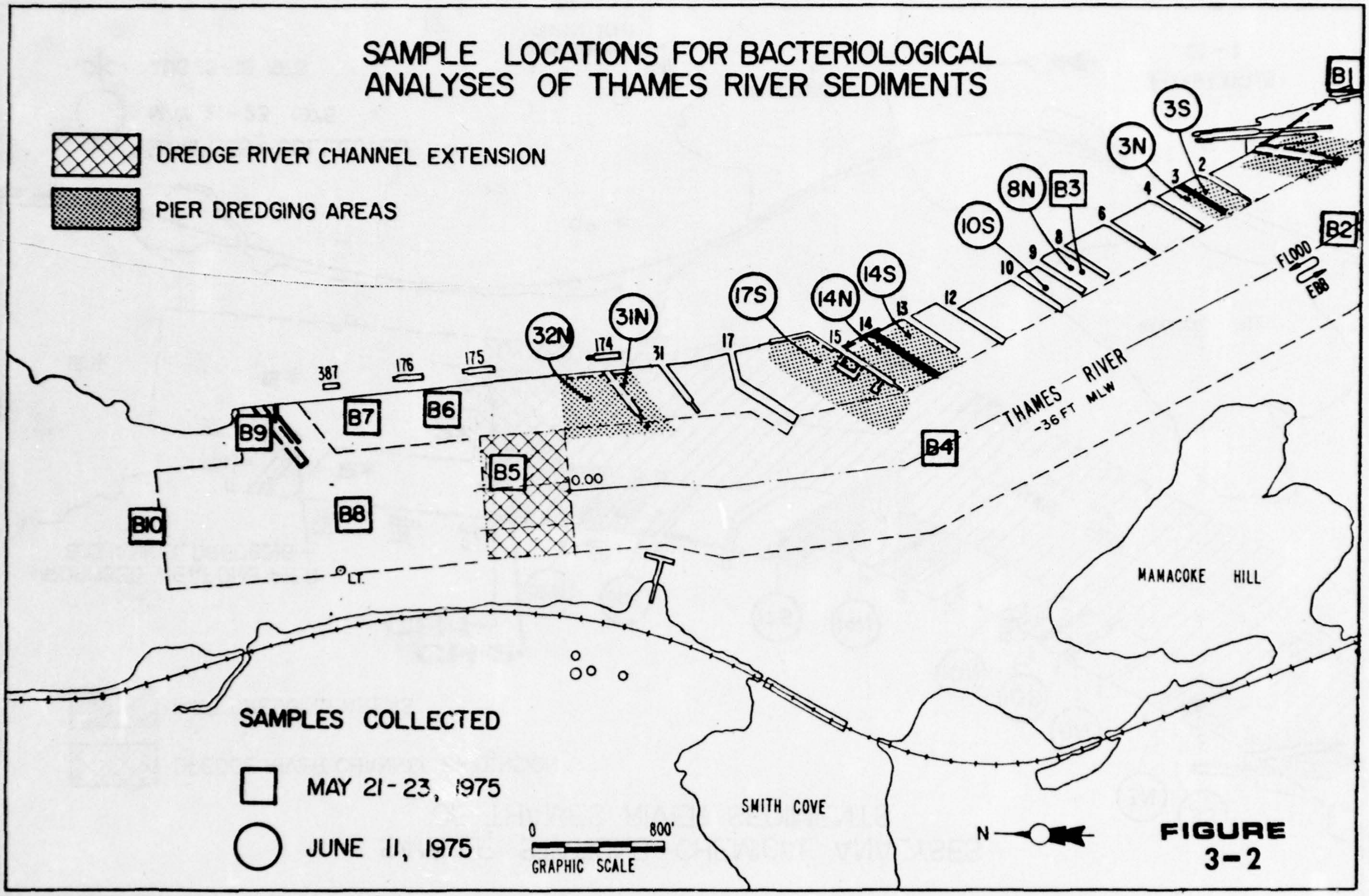
3.15 Sediments, General: Physical, chemical and benthic characteristics of sediments in the Thames River Estuary are described in Sections 2.06 through 2.09 of the FEIS. Sediment samples from project areas associated with Navy Projects were collected in two phases and are described herein. Phase I sampling was conducted on May 21-23, and Phase II sampling on August 15-18, 1975 (fig. 3-1) by the Naval Underwater Systems Center (NUSC), New London, CT. The physical, chemical and biological characteristics of the sediments were analyzed by NUSC, New London, CT and NUSC, Newport, RI. Bacteriological samples were also collected on May 21-23 and June 11, 1975 (fig. 3-2) and were subcontracted to ECO-Science Laboratories of Norwich, CT for analysis. Field sampling and laboratory methodology are presented in Appendix H.

3.16 Chemical characteristics of proposed project spoils were evaluated using dredge spoil disposal criteria of 1971 (ref. 216) and the "Ocean Dumping Criteria" of 1973 (ref. 240). In this way a data format is maintained between the original FEIS and this supplement so that data



SAMPLE STATIONS- CHEMICAL ANALYSES
OF THAMES RIVER SEDIMENTS
DREDGE RIVER CHANNEL EXTENSION
PIER DREDGING AREAS
PROPOSED WEAPONS PIER
& CHANNEL DREDGING
CH-2
CH-1
32N
31N
17S
14N
10N
10S
8N
3N
3S
387
176
175
174
31
17
15
14
13
12
10
9
8
6
4
3
2
1*
2*
3*
4*
5*
6*
7*
0.00
LT.
THAMES - RIVER
-36 FT MLW
FLOOD
EBB
MAMACOKE HILL
SMITH COVE
SAMPLES COLLECTED
MAY 21-23 1975
AUG 15-18 1975
0
800'
GRAPHIC SCALE
N

FIGURE 3-1


SAMPLE LOCATIONS FOR BACTERIOLOGICAL
ANALYSES OF THAMES RIVER SEDIMENTS
DREDGE RIVER CHANNEL EXTENSION
PIER DREDGING AREAS
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
3S
3N
8N
10S
14S
14N
17S
31N
32N
2
3
4
6
8
9
10
12
13
14
15
17
31
174
175
176
387
FLOOD
EBB
THAMES RIVER
-36 FT MLW
0.00
LT.
MAMACOKE HILL
SMITH COVE
SAMPLES COLLECTED
MAY 21-23, 1975
JUNE 11, 1975
0
800'
GRAPHIC SCALE
N
FIGURE
3-2

comparisons can be easily made. On September 5, 1975 the EPA issued new rules and regulations pertaining to the "Discharge of Dredged or Fill Material into Navigable Waters" (40 CFR 230, see Appendix C). Having sampled Navy project dredge spoil prior to the issuance of these regulations, approval for the sampling program and methodology was solicited from the COE and determined to be in compliance with existing criteria.

3.17 Physical Description. The surface sediments from the project areas, are gray-black to black in color and generally classified as medium to coarse silt or sandy silt, highly organic and of high water content. The basal material observed in the core samples was a brown, rather plastic, fine grained sediment. However, several sites were observed to contain coarse sediment from the near surface to the bottom of the core sample. Also, gravel was observed in samples 3S and 17S, and heavy concentrations of dead and broken shells were noted in samples 10N and 10S.

3.18 The results of the physical analyses for Phase I and Phase II sampling programs are shown in tables 3-1 and 3-2 respectively. Three tests were run on the Phase I samples: flocculation test (sieve and hydrometer), standard grain size distribution (sieve and hydrometer), and assorted spot-check tests, which will be described. Water content in all samples varied non-uniformly with depth. The organic content, which was determined from soaking the samples in a 10% solution of hydrogen peroxide, varied from 18% to 24%. Carbonates were removed

TABLE 3-1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS FROM BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

SAMPLING STATION	PENETRATION DEPTH	SAMPLE LENGTH	CORE DATA DEPTH	FLOCCULATION TEST MEAN DIAM mm	FLOCCULATION TEST SORT. COEFF	FLOCCULATION TEST SETTLE TIME HR:MIN	STANDARD GRAIN SIZE TEST MEAN DIAM mm	STANDARD GRAIN SIZE TEST SORT. COEFF	STANDARD GRAIN SIZE TEST SETTLE TIME HR:MIN	ORGANIC CONTENT %	CARBONATE CONTENT %	WATER CONTENT %
3S	13'	3'6"	6"	.040	1.45	4:00					1.79	269
			20"	0.86	2.58	sieve *					1.61	32
			33"	0.29	1.44	sieve *					0.20	19
3N	10'	3'	3"	.036	1.29	17:00					2.18	361
			33"	.034	2.03	0:30					3.81	246
8N	17'	5'	3"	.035	1.50	4:00	.022	2.96	48:00	24.35	0.83	
			12"	.042	3.24	7:00					1.91	
			24"	.032	1.41	7:00	.033	3.56	48:00		0.56	
			36"	.050	1.68	7:00					1.03	
			48"	.027	1.32	2:00	.033	3.44	48:00		0.58	
			60"	.033	1.34	1:00	.033	3.46	24:00		1.64	
10S	10'	2'	3"	.037	1.41	0:30					2.68	324
			22"	.064	1.39	0:30	.031	2.12	24:00		14.68	9
10N	16'	7'	3"	.028	1.34	0:30					21.30	261
			19"	.039	1.70	0:30					3.15	191
			36"	.044	1.70	0:20					1.24	181
			48"	.039	1.70	0:20					1.23	269
			66"	.043	1.66	0:30					1.15	
			78"	.022	1.52	4:00					0.71	101
14N	16'	9'	3"									
			24"	.067	1.52	0:30					2.04	
			48"	.032	1.41	4:00	.028	3.29	24:00		0.86	
			60"				.028	3.29	24:00		0.61	
			84"	.036	1.69	7:00					1.35	
			108"	.058	1.48	7:00				17.98	0.45	
17S	20'	9'6"	3"	.088	1.59	2:00					0.82	153
			24"	.057	1.66	0:20					1.76	201
			48"			sieve *	3.19	10.08			0.70	
			60"	.048	1.69	2:00					1.59	245
			84"	.049	1.85	2:00					5.11	68
			108"	.048	1.55	2:00					0.36	97
31N	15'	9'3"	3"	.033	1.36	4:00	.019	2.93	24:00		0.80	
			24"	.030	1.46	4:00	.023	3.79	24:00		0.73	
			49"	.047	1.77	7:00					2.05	
			60"	.050	2.06	7:00					1.90	
			84"	.057	1.71	4:00				18.18	0.85	
			108"	.027	1.33	2:00	.036	3.08	24:00		0.39	

*No Hydrometer Test

TABLE 3-1 continued

SAMPLING STATION	PENETRATION DEPTH	SAMPLE LENGTH	CORE DATA DEPTH	MEAN DIAM mm	SORT. COEFF	SETTLE TIME HR:MIN	MEAN DIAM mm	SORT. COEFF	SETTLE TIME HR:MIN	ORGANIC CONTENT %	CARBONATE CONTENT %	WATER CONTENT %
32N	15'	9'6"	6"	.054	1.52	4:00					9.44	204
			48"	.040	1.25	2:00					0.20	149
			72"	.043	1.34	1:00					1.80	100
			101"	.043	1.26	1:00					3.69	119
CH.1	17'	10'	3"	.050	1.73	2:00					2.34	192
			30"	.076	1.40	2:00					0.53	87
			41"	.032	1.63	2:00					2.51	176
			60"	.020	1.82	7:00					0.61	115
			72"	.026	1.30	2:00					0.95	130
			84"	.030	1.32	4:00					0.87	238
			108"	.069	1.10	2:00					0.80	86
CH.2	17'		3"	.041	1.20	2:00					4.22	191
			18"	.026	1.26	4:00					2.02	124
			30"	.051	2.04	4:00					1.57	146
			52"	.036	1.41	sieve *					0.80	37
			72"	.048	1.38	2:00					1.00	130
			84"	.055	1.61	4:00					1.37	164
			102"	.055	1.39	0:20					1.13	105
			120"			sieve *	.042	1.48			1.10	25

*No Hydrometer Test

Samples collected May 21-23, 1975

TABLE 3-2 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS FROM BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT
PHASE II

SAMPLING STATION	CORE DATA DEPTH (cm)	MEANS DIAM (mm)	SORT COEFF	SAND %	SILT %	CLAY %	SED TYPE	ORGANIC CONTENT %	CARBONATE CONTENT %	WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX	EROSION %	SETTLING VELOCITY
1	40	.024	2.5	16	64	20	clayey silt	10		43					
	75	.107	3.7	29	59	12	sandy silt	9.8		51					
	140	.035	3.2	23	61	16	sandy silt	6.6	11.2	100	89	51	38	21	1.78
	190	.035	3.2	25	59	16	sandy silt	8.7		37					
	235							9.9	5.4	100	98	38	60	4	
	265	.043	3.2	32	54	14	sandy silt								
2	85	.031	3.1	20	62	18	sandy silt	9.9		36					
	200	.036	3.6	25	56	19	sandy silt	8.0		15					
3	50	.025	4.5	18	58	24	clayey silt	8.0		20					
	100							8.4	7.5	140	132	52	80	11.2	
	315	.01	4.1	8	66	24	clayey silt								1.56
	410							7.6	3.8	100	83	40	43	20.0	1.83
	430	.031	2.3	20	62	18	sandy silt								
4	75	.052	3.3	28	56	16	sandy silt	10.2		42					
	150	.03	3.8	20	62	18	sandy silt	8.2	7.1	132	129	62	57	10.7	1.56
	240							8.9	5.2	142	128	60	68	15.4	
	290	.02	4.2	14	58	28	clayey silt								

TABLE 3-2 continued

SAMPLING STATION	CORE DATA DEPTH (cm)	MEANS DIAM (mm)	SORT COEFF	SAND %	SILT %	CLAY %	SED TYPE	ORGANIC CONTENT %	CARBONATE CONTENT %	WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX	EROSION %	SETTLING VELOCITY
5	80	.047	2.5	26	58	16	sandy silt	6.8		26					
	165	.047	2.75	35	55	10	sandy silt	6.6	7.8	102	72	34	38	15	1.84
	200	.24	8.7	39	50	11	sandy silt								
	260							8.6	14.6	140	125	85	40	23	1.52
	340	.053	2.3	37	50	11	sandy silt								
6	70	.05	2.9	36	52	12	sandy silt	6.8		39					
	145	.083	3.2	52	37	11	silty sand	6.0	8.2	78	55	30	25	15.4	
	190	.109	3.5	37	49	14	sandy silt	7.0		47					
	240							5.1	6.9	86	117	62	55	4.4	1.87
	290	.026	2.9	17	65	18	sandy silt	6.8							
7	80	.015	3.4	10	67	23	clayey silt	6.9							
	100	.465	1.7	88	NOT DETER-MINED		sand			140	127	58	69	17.4	
	190	.09	3.7	39	47	14	sandy silt	13.1	12.8	129					
	205							6.1		67	64	32	32	5.5	1.98
	230	.083	2.8	45	43	12	silty sand								1.65
8N	40							11		220					
	100	.029	2.0	24	66	10	sandy silt	11		144					
	145							9		109					
	210	.37	3.0	76	19	5	sand	1		21					
	290	.53	1.7	92	5.5	1.5	sand	0.9		20					

using an acetic acid solution buffered to pH 4.8 with sodium acetate. The calcium carbonate content, mostly in the form of shell material, varied from 1.2% to 21% but generally was less than 10%.

3.19 The mean diameter and sorting coefficient values reported are of little value in describing the physical character of the sediment, since the hydrometer portion of the flocculation test differs significantly from the empirical standard hydrometer test (table 3-1). The difference being, in the flocculation test the particles are not dispersed prior to settling, and salt rather than fresh water serves as the settling fluid. It is interesting to note however, that the sorting coefficients derived from the flocculation test are lower, e.g. better sorted, than those obtained from the corresponding standard grain size test. This apparent improved sorting actually reflects the aggregation of the individual fine particles as a 'floc size', and reduces settling times compared with those observed from standard hydrometer tests. Differences in settling times derived from flocculation tests and corresponding standard hydrometer test have been determined.

3.20 Three Spot-Check Tests were conducted on selected samples to test the individual influence of particle size on the settling times of organic content, carbonate content, drying, and inclusion of the coarse fraction (table 3-3). For tests C-1 and C-2 the total sample was dried and pulverized before sieving, and the fine fraction was used in the hydrometer test. Test C-1 was conducted to remove the carbonates and organics before settlement in the hydrometer test, using New London

TABLE 3-3 SPOT-CHECK TESTS FOR PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS FROM BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT.

SITE NO.	CORE DATA DEPTH	MEAN DIAM mm	SORT. COEFF	SETTLE TIME hr. min.	ORGANIC CONTENT %	CARBONATE CONTENT %
Test C-1						
14N	Top	.038	2.34	7:00		2.11
	Bot	.038	2.81	7:00	17.98	1.23
31N	Mid	.020	1.82	7:00		0.69
Test C-2						
14N	Top	.049	1.58	1:00		
	Bot	.057	1.71	4:00		
31N	Mid	.040	1.33	3:00		
Test C-3						
14N	Top	.045	1.37	1:00		
	Bot	.053	2.00	1:00		
31N	Mid	.053	1.78	2:00		

dump site water. Only the carbonates were removed in the C-2 test. In the C-3 test, the raw aggregate, or total natural sample, was partially dessicated to remove excess water, pulverized, and placed in the hydrometer filled with New London dump site water.

3.21 The results of these few tests are inconclusive, but serve to illustrate the variability of the data using the same samples. Test C-3 most closely simulates the field condition, except for the boundary conditions imposed by the size of the settling tube. The settling times determined from the C-3 test tended to be less than those determined from other tests, for the same samples.

3.22 Bulk Analyses. Four sets of bulk chemical analyses have been performed on Thames River sediments since the publication of the FEIS in December, 1973; two by the Navy, one by the Coast Guard, and one by Electric Boat. The 1971 EPA Dredge Spoil Disposal Criteria (ref. 216) were expressed as limits on percent dry weight concentrations of pollutants which are measured by bulk chemical analysis. These criteria have been superseded by the elutriate analysis for determining spoil acceptability. Although bulk analysis may generally indicate the kinds and quantities of chemical constituents in dredge spoil, recent laboratory studies (ref. 275) show that it should not be used for assessing the effects of spoil disposal on the environment. Nevertheless, results of more recent bulk chemical analyses for volatile solids, chemical oxygen demand, total nitrogen, oil and grease, heavy metals phenols, DDT, and PCB (Polychlorinated Biphenyls) are presented below to allow comparison to results presented in the FEIS.

3.23 Table 3-4 reproduces a portion of table 2 (page 40) of the FEIS. These data represent analyses of samples recovered from the channel bottom to be dredged during the 2nd increment. They serve as a base to which later results may be compared, and as a description of channel sediments to be dredged during the 2nd increment. Generally, sediments to be dredged during the 2nd increment, including pierside sediments, contain higher concentrations of chemical constituents than observed in 1st increment sediments. Bulk chemical analyses of berthing area and dockside sediments are presented in table 3-5 and represent three data sources. Navy sampling efforts in May and August 1975, serve to characterize the materials to be dredged in the immediate vicinity of the Submarine Base docks. Coast Guard data, taken from their Draft EIS (ref. 222), demonstrate sediment quality at the Thames Shipyard. Data from Electric Boat charaterize spoil from the largest single private dredging action expected in the Thames River. Detailed locations of the Coast Guard and Electric Boat sampling efforts are found in Appendix D.

3.24 The 1971 EPA standard for volatile solids was 6 percent dry weight. The concentration of volatile solids in Thames River channel sediments (table 3-4) averages 8.9 percent dry weight, and all observations are in excess of the standard. Sediments in the Navy berthing areas (table 3-5) average 8.3 percent volatile solids, and all but seven observations are greater than the standard. Coast Guard and Electric Boat samples averaged 8.6 and 4.8 percent, respectively. All of the Coast Guard samples and six of the Electric Boat samples were greater than the 6 percent standard. These high values may be

BULK CHEMICAL ANALYSES
THAMES RIVER CHANNEL SEDIMENTS; % Dry Weight

1971 EPA CRITERIA	6.0	5.0	0.10	0.15	0.0001	0.005	0.005
Number	Vol Sol	COD	N	OIL	Hg	Pb	Zn
BH-12	6.61	5.23	0.16	0.11	0.000003	0.0035	0.0023
BH-17	6.63	4.94	0.15	0.09	0.000002	0.0041	0.0020
BH-19	7.09	5.66	0.20	0.13	0.000014	0.0049	0.0019
BH-21	7.59	6.09	0.094	0.12	0.000002	0.0016	0.0016
BH-23	6.63	5.50	0.16	0.10	0.000002	0.0013	0.0027
BH-26	11.60	9.93	0.20	0.14	0.000016	0.0071	0.0055
BH-34	10.91	9.58	0.22	0.11	0.000002	0.0077	0.0051
BH-29	10.76	9.05	0.20	0.12	0.000002	0.0086	0.0056
BH-35	11.13	9.87	0.30	0.13	0.000002	0.0081	0.0056
BH-31	9.74	8.12	0.27	0.16	0.000002	0.0075	0.0055
BH-32	9.16	7.90	0.22	0.10	0.000002	0.0064	0.0054
$\bar{X}$ =	8.90	7.44	0.20	0.12	0.000004	0.0055	0.0039
σ =	2.03	2.00	0.06	0.02	0.000005	0.0026	0.0018

Source: FEIS, TABLE 2, page 40

TABLE 3-4

BULK CHEMICAL ANALYSES
THAMES RIVER BERTHING AREA SEDIMENTS; % Dry Weight

1971 EPA CRITERIA		6.0	5.0	0.10	0.15	0.0001	0.005	0.005
Number		Vol Sol	COD	N	OIL	Hg	Pb	Zn
3N Top	Navy Phase I	10.8	-	0.12	0.745	0.00010	0.024	0.038
3S Top		2.0	-	0.17	0.042	-	0.064	0.086
8N Top		11.7	-	0.12	1.3	0.000220	0.042	0.183
Mid		10.9	0.0113	0.11	0.625	0.000100	0.038	0.047
Bott		5.3	-	-	0.045	0.000050	0.006	0.008
10N Top		12.1	0.1232	0.18	0.925	0.000220	0.027	0.059
Mid		11.5	0.0030	0.10	0.250	0.000010	0.008	0.017
Bott		7.8	-	-	0.033	0.000010	0.002	0.005
10S Top		13.8	-	-	0.920	0.000100	0.020	0.049
14N Top		10.4	0.0973	0.09	0.460	0.000130	0.018	0.041
Mid		8.5	0.0903	0.06	0.060	0.000050	0.003	0.007
Bott		9.3	0.0585	-	0.067	0.000060	0.004	0.013
17S Top		7.5	-	0.07	0.340	0.000090	0.016	0.019
Mid		8.6	0.0264	0.09	0.075	0.000040	0.005	0.006
Bott		7.3	0.0256	-	0.028	0.000020	0.003	0.024
31N Top		10.3	0.0060	0.10	0.360	0.000230	0.015	0.023
Mid		8.2	0.0092	0.09	0.022	0.000040	0.004	0.008
Bott		10.0	-	-	0.052	0.000020	0.003	0.007
32N Top		10.6	-	0.14	0.266	0.000110	0.011	0.020
Mid		9.2	0.0199	0.13	0.290	0.000140	0.010	0.016
Bott		10.6	0.0054	-	0.043	0.000080	0.003	0.006
TBSH Top		8.0	-	0.09	0.253	0.000100	0.023	0.018
Mid		5.3	-	0.07	0.015	0.000030	0.006	0.006
Bott		3.1	0.0010	-	0.030	0.000050	0.004	0.005

TABLE 3-5

BULK CHEMICAL ANALYSES
THAMES RIVER BERTHING AREA SEDIMENTS; % Dry Weight (cont)

1971 EPA CRITERIA		6.0	5.0	0.10	0.15	0.0001	0.005	0.005
Number		Vol Sol	COD	N	OIL	Hg	Pb	Zn
1	Electric Boats, Various Dates	2.4	11.35	0.15	0.280	0.000020	0.012	0.040
2		1.5	7.04	0.17	0.110	0.000008	0.009	0.018
3		2.1	3.51	0.08	0.140	0.000004	0.009	0.028
4		1.9	5.74	0.12	0.290	0.000006	0.024	0.040
5		1.7	7.46	0.18	0.370	0.000016	0.011	0.033
1		6.2	17.47	0.27	0.428	0.000043	0.012	0.031
2		1.2	7.43	0.17	0.055	0.000016	0.002	0.009
3		4.4	8.20	0.15	0.075	0.000054	0.003	0.012
4		5.1	8.98	0.22	0.257	0.000076	0.007	0.029
5		2.8	5.00	0.11	0.051	0.000015	0.003	0.009
6		6.8	10.57	0.22	0.717	0.000046	0.011	0.043
7		8.6	16.24	0.34	0.964	0.000016	0.019	0.064
8		8.4	13.75	0.25	1.064	0.000060	0.047	0.145
1		5.3	9.86	0.15	0.102	0.000019	0.004	0.010
2		6.2	9.83	0.17	0.092	0.000068	0.012	0.020
1		5.1	5.45	0.13	0.016	0.000016	0.003	0.014
2		9.4	10.73	0.27	0.649	0.000090	0.013	0.053
2A		5.5	6.08	0.15	0.008	0.000002	0.002	0.012
3		5.7	6.54	0.11	0.070	0.000310	0.006	0.013
4		4.2	5.02	0.09	0.076	0.000030	0.004	0.012
5A		5.8	6.32	0.12	0.266	0.000026	0.018	0.047
$\overline{X}$ Navy		8.3	0.037	0.11	0.216	0.000059	0.012	0.019
σ Navy		2.7	0.042	0.03	0.305	0.000064	0.013	0.030
$\overline{X}$ CG		8.6	20.7	0.53	0.091	0.000053	0.014	0.016
σ CG		2.3	9.7	0.50	0.052	0.000019	0.012	0.012
$\overline{X}$ EB		4.8	8.7	0.17	0.290	0.000045	0.011	0.032
σ EB		2.4	3.7	0.07	0.311	0.000066	0.010	0.030

BULK CHEMICAL ANALYSES
THAMES RIVER BERTHING AREA SEDIMENTS; % Dry Weight (cont)

Number			Vol Sol	COD	N	OIL	Hg	Pb	Zn
1971 EPA CRITERIA			6.0	5.0	0.10	0.15	0.0001	0.005	0.005
1	Top	Navy Phase II	13.6	-	-	0.203	0.000030	0.010	0.003
	Cent		7.9	-	-	0.026	0.000004	0.005	0.001
2	Top		8.4	-	-	0.215	0.000017	0.011	0.003
	Cent		7.5	-	-	0.125	0.000008	0.009	0.002
3	Top		6.8	-	-	0.060	0.000005	0.004	0.002
	Cent		6.4	-	-	0.020	0.000008	0.005	0.002
4	Top		7.6	-	-	0.031	0.000010	0.007	0.002
	Cent		4.4	-	-	0.064	0.000004	0.006	0.002
5	Top		6.8	-	-	0.076	0.000008	0.007	0.002
	Cent		9.4	-	-	0.025	0.000006	0.005	0.001
6	Top		4.4	-	-	0.010	0.000010	0.008	0.001
	Cent		5.2	-	-	0.031	0.000002	0.002	0.001
7	Top		8.1	-	-	0.065	0.000014	0.009	0.002
	Cent		7.4	-	-	0.021	0.000009	0.008	0.002
N2		Coast Guard	7.6	18.0	0.35	0.076	0.000030	0.009	0.011
N1			7.4	15.0	0.22	0.038	0.000050	0.006	0.007
C1			13.2	40.0	1.40	0.190	0.000080	0.039	0.041
C2			8.9	20.0	0.84	0.089	0.000070	0.008	0.014
C3			7.0	16.0	0.07	0.067	0.000050	0.012	0.012
S1			7.7	15.0	0.27	0.088	0.000040	0.011	0.013

clear indications of polluted conditions. In comparison, Pierce (ref. 59) reported organic matter at 0.53 percent dry weight in Rhode River (MD) sediments. This subestuary to Chesapeake Bay is generally free from industrial development and unpolluted.

3.25 The 1971 EPA standard for chemical oxygen demand (COD) was 5 percent dry weight. COD concentrations ranging from 4.94 percent to 9.93 percent were found in channel sediments; the average value was 7.44 percent. Values in excess of 5 percent were also found by the Coast Guard (20.7 percent, average) and Electric Boat (8.7 percent, average). In the case of the Navy 1975 samples, bulk analyses for COD concentrations were not made; rather, estimates were made by correcting for chloride interference and extrapolating results from elutriate data (see Appendix H). This procedure yielded calculated COD concentrations which averaged 0.037 percent dry weight.

3.26 Correcting for chloride interference resulted in COD values being several orders of magnitude lower than previously collected data and suggest that COD data may be a poor indicator of estuarine sediment quality. This position is supported in a research study by Keeley and Engler (ref. 112) on dredge material disposal criteria which states that COD and volatile solids "... provide little meaningful information when applied to sediments, especially marine sediments."

3.27 Nearly all observations of total organic nitrogen were in excess of the 0.10 percent criteria level. Concentrations averaged 0.20 percent in the channel sediments, 0.11 percent in the Navy berthing sediments, 0.53 percent at the Coast Guard site, and 0.17 percent at Electric Boat. In contrast, Duedall, Connors, and Irwin (ref. 71) reported

sewage sludges dumped in the New York Bight to contain in excess of 4 percent organic nitrogen on a dry weight basis.

3.28 Oil and grease concentrations from the channel segment of 2nd increment dredging average 0.12 percent dry weight and only one observation exceeded the criteria value of 0.15 percent. The berthing area sediments exhibit higher oil and grease concentrations, probably derived from ship maintenance and dockside spills. This is reflected in both Navy and Electric Boat analysis of samples, which average 0.216 and 0.290 percent oil and grease, respectively. Coast Guard results were similar to the channel results, with an average of 0.091 percent and only one observation in excess of 0.15. Thus, judged by the 1971 criteria, channel sediments are acceptable and most of the berthing area sediments are unacceptable.

3.29 That the Naval Submarine Base, New London, may be a contributor to the above mentioned problem is recognized. Kubo and Hillman (ref. 116) reported the presence of oil on both surface waters and riverbed rocks north of the Submarine Base. Visual observations of bottom grabs collected on June 11, 1975 have shown oily sediments to exist in the berthing areas and in the channel a short distance north and south of the Base. Oil was not observed in sediments collected from shallow areas west of the channel markers or opposite of the Base.

3.30 An engineering study was conducted in 1974 which thoroughly evaluated one of the suspected sources, i.e. the inadequacies of the oil distribution system on the Base (ref. 257). Underground oil

seepage is known to be a product of leakage throughout the system, and oil has been detected in the ground adjacent to berthing areas on the southern portion of the Base. A localized geological study has shown that the character of the underlying strata may convey this underground seepage to the river (Appendix I).

3.31 Oily water has been observed entering the Thames River at the Submarine Base via culverts, catch basins, and storm drains. The sources of this oil appear to be surface oil from parking lots, surface seepage, etc. In addition, cracks were observed in oil pipe lines that run adjacent to the storm drain system on the Base.

3.32 An oily waste handling and disposal study has been made to determine the best methods for containing oily wastes generated from ship and shore-side activities (ref. 75). Plans are now being made to abate the oil pollution originating from the Submarine Base.

3.33 Measurements of mercury, lead, and zinc are included in tables 3-4 and 3-5 to allow comparison to 1973 channel samples and comparison among the various more recent programs. Although no standards were prescribed for chromium, cadmium, or copper in the 1971 EPA Guidelines, analyses for these heavy metals were conducted on the recent Navy samples. These results are presented in table 3-6.

3.34 In no observation of channel sediments was the mercury limit of 0.0001 percent exceeded or even closely approached. Berthing sediments were nearly as mercury-free, with average values for Navy, Coast Guard,

TABLE **3-6** CHEMICAL ANALYSES OF SPOIL FROM BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

PHASE I

PERCENT DRY WEIGHT

Sample Stations	Section Length	Cr	Cd	Cu	Phenol	DDT	PCB
3N TOP	38"	.0120	.0016	.021	.0003	.00001	.00014
3S TOP	38"	.0029	.0013	.004	.0001	.00001	.00010
8N TOP	37"	.0140	.0016	.025	.0002	.00001	.0006
8N MID	24"	.0120	.0016	.027	.0003	.00001	.0007
8N BOT	24"	.0047	.0011	.003	--	--	--
10N TOP	42"	.0140	.0019	.023	.0010	.00001	.0011
10N MID	22"	.0075	.0012	.009	.0009	.00001	.00005
10N BOT	22"	.0029	.0005	.002	--	--	--
10S TOP	22"	.0130	.014	.020	.0003	.00001	.00006
14N TOP	48"	.0120	.0016	.010	.00014	.00004	.00104
14N MID	30"	.0046	.0013	.002	.00010	.00001	.00008
14N BOT	30"	.0055	.0013	.006	--	--	--
17S TOP	48"	.0088	.0011	.009	.00003	.00001	.00006
17S MID	30"	.0045	**.0010	.003	.00012	.00001	.00005
17S BOT	39"	.0033	.0013	.002	--	--	--
31N TOP	48"	.0120	.0013	.016	.00006	.00001	.00005
31N MID	30"	.0042	.0012	.003	.0002	.00001	.00005
31N BOT	30"	.0040	.0011	.002	--	--	--

TABLE 3-6 (continued)

PERCENT DRY WEIGHT

Sample Stations	Section Length	Cr	Cd	Cu	Phenol	DDT	PCB
32N TOP	50"	.0100	.002	.018	.00003	.00001	.00005
32N MID	30"	.0091	.0010	.011	.0002	.00001	.00007
32N BOT	30"	.0041	.0011	.002	--	--	--
CH.1 TOP	50"	.0048	.0011	.003	.00013	.00001	.00005
CH.1 MID	30"	.0042	.0012	.002	.00006	.00001	.00005
CH.1 BOT	30"	.0040	.0014	.002	--	--	--
CH.2 TOP	52"	.0087	.0012	.008	.00012	.00001	.00007
CH.2 MID	38"	.0032	.0011	.004	.00010	.00001	.00006
CH.2 BOT	38"	.0024	.0009	.001	--	--	--

PARTS PER MILLION = PERCENT DRY WEIGHT x 10^4

* Less than dumpsite water

** Loss on transfer

Samples collected May 21-23, 1975

and Electric Boat programs all clustered around 0.00005 percent (50% of the criteria value). In only nine of 70 observations of berthing area sediment data did mercury content equal or exceed the criteria value.

3.35 Lead and zinc concentrations were found to be higher in the berthing areas than in the channel. Most of the sediments sampled contained one or both of these metals in excess of the criteria value of 0.005 percent dry weight.

3.36 Standards for Phenols, DDT and PCB were not established for sediments under EPA 1971 criteria (ref. 216). The observed concentrations of DDT are small and in many cases are reported as less than the detectable limits. Although the PCB concentrations are somewhat higher than DDT, the overall significance of specific concentrations as they relate to the long-term cumulative effects within food webs has yet to be determined. These data are also presented in table 3-6.

3.37 A statistical analysis of variance (ref. 67) was performed on the sediment core data from fifteen stations within the proposed project areas (fig. 3-1). Volatile solids, oil and grease and six heavy metals were tested. Each sampling location was characteristically different (table 3-7). Except for volatile solids, all constituents were found to be more concentrated in the top strata (table 3-8). Concentrations for all parameters showed a significant linear trend downward at the 1% confidence level (table 3-9). Compared to the berthing areas the Channel Extension was found to have lower chemical concentrations for most parameters tested, the reason being that these

TABLE 3-7 COMPARISON OF MEAN ($\bar{X}$) CHEMICAL CONCENTRATIONS FOR SAMPLING LOCATIONS AT THE NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT

Station No.	% Vol Sol	Oil/Grease	Hg	Pb	Cr	Cd	Cu	Zn
8N	11.3	7625	1.6	324	97	16	259	635
10N	11.8	5875	1.2	147	84	15	156	380
14N	9.4	2600	.89	75	69	14	63	239
17S	8.1	2075	.61	88	60	10	61	126
31N	9.2	1910	1.4	85	77	13	95	153
32N	9.9	2330	1.2	106	84	13	148	177
CH 1	6.6	1337	.91	115	53	11	59	120
CH 2	7.3	141	.34	56	38	12	24	64
1	10.7	1143	.17	74	97	6	43	22
2	7.9	1700	.13	100	107	7	54	24
3	6.6	395	.07	45	70	6	23	16
4	6.0	476	.07	67	64	6	19	15
5	8.1	503	.07	58	70	6	24	16
6	4.8	206	.06	52	28	6	11	9
7	7.7	425	.11	83	74	11	34	20

Volatile Solids = % Dry Weight

All Other Parameters = ppm

TABLE 3-8 STATISTICAL TEST FOR SIGNIFICANCE OF SAMPLE LOCATIONS

	Volatile Solids	Oil/ Grease	Hg	Pb	Cr	Cd	Cu	Zn
$\bar{x}$	8.4	1916	.59	99	72	10.2	72	135
Significance 1%	+	+	+	+		+	+	+
Significance 5%					+			

TABLE 3-9 STATISTICAL TEST FOR SIGNIFICANCE OF SAMPLE POSITION IN CORE

	Volatile Solids	Oil/ Grease	Hg	Pb	Cr	Cd	Cu	Zn
$\bar{x}$	8.8	2784	.82	128	89	11.2	93	187
Significance 1%		+	+	+	+	+	+	+
Not Significant	+							

NOTE: Significance at 1% level = 99% confidence limit
Significance at 5% level = 95% confidance limit

stations are probably more representative of the less polluted sediments existing in the channel.

3.38 Station 8N was found to contain the highest concentrations in most of the parameters analyzed. This observance is probably related to pier use. Pier 8 has been subjected to the heaviest use due to its central location. In addition, Pier 8 serves as a fueling station for diesel powered vessels. Improved methods for transfering fuel and handling of waste materials should significantly decrease concentrations in these areas in the future.

3.39 Bacteriological Character. Realizing the environmental impacts associated with ship-board wastes, sediments from berthing areas were collected for sediment bacteriological analyses.Sediments were analyzed for the presence of total coliform, fecal coliform, fecal streptococci, staphylococci and salmonella. High coliform counts were observed as were the presence of pathogens (table 3-10).

3.40 Prior to drawing any conclusions in regard to the data, the inherent problems associated with obtaining representative grab samples for Bacteriological analyses of sediments must be realized. The data observed may or may not be representative of the total area at the sample location. Concentrations of bacteria may differ considerably a few centimeters or inches from the sampling point. These differences are not adequately reflected in data obtained on the basis of one grab sample. Tidal conditions may be responsible for the distribution

TABLE 3-10 BACTERIOLOGICAL ANALYSES OF THAMES RIVER SEDIMENTS BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT.

SAMPLE LOCATIONS	DATE	TIME	TIDAL CONDITIONS	SHIPBOARD PERSONNEL	*TOTAL COLIFORMS	*FECAL COLIFORMS	*FECAL STREPTOCOCCUS	*STAPHY-LOCOCCUS	SALMONELLA
					(Bacteria/Gram of Wet Sediments)				
3 North	5/23	1315	Ebb	100	533	139	21	40	9
3 South	5/22	1230	Ebb	3	870	13	14	30	4
8 North	5/22	1130	Ebb	0	715	13	22	39	15
10 South	5/22	1430	Flood	0	475	57	2	79	5
14 North	5/22	1045	Ebb	20	50	7	3	33	1
14 South	5/22	1515	Flood	20	75	7	3	49	6
17 South	5/23	1215	Ebb	107	110	1	5	15	5
31 North	5/21	1530	Slack	0	620	8	11	28	12
32 North	5/21	1400	Ebb	0	756	24	13	30	6
CH.2	5/21	0915	Ebb	-	900	40	24	27	3
CH.1	5/21	1415	Slack	-	169	13	12	16	1

North = Upstream

Samples Collected May 21 - 23, 1975

*Average of Two Replicates

of organisms. Pier usage or numbers of ship-board personnel assigned to each pier may or may not explain the quantities of bacteria observed at specific locations. In addition, concentrations of bacteria in sediments may persist for some time after piers are vacant. Therefore, the data should only be used to indicate the presence of organisms as well as the relative concentration levels which exist between one location and another.

3.41 In this context several observations can be made as to relative concentrations. Except for staphylococci, Pier 14 exhibits the lowest concentration of bacteria per gram of wet sediment as compared to the total berthing areas sampled. This may be a direct effect of pier usage at this location. In addition, significantly lower concentrations are reported for the channel than for any of the berthing areas.

3.42 The presence of pathogens in Thames River sediments was reported and described from a pilot study described in Para 2.07-2.07g of the FEIS. It should be noted that salmonella and other pathogens of man exist in the environment in relatively small numbers as compared to coliform bacteria. The probability of pathogen presence increases as the concentration of coliforms increases. This is the basis for using coliform densities as an indication of sewage contamination. Therefore, where coliform concentrations are lowest, relatively large samples are needed to detect the presence of pathogens. Although salmonella was not detected in previous studies, the probability for its existence in the channel proper is high. Higher concentrations

of coliforms in and around the NAVSUBASE significantly increase the probability for the detection of pathogens as was observed.

3.43 A second series of sediment samples $B_1 - B_{10}$ were collected in order to assess localized sewage impacts of the NAVSUBASE on the Thames River (table 3-11). Stations 8N and B5 were taken in the same general areas as reference points. The differences in total coliform concentrations observed are most likely due to differences in the sediment sampling locations rather than pier usage.

3.44 The highest concentration of total coliforms was observed at stations B_4 and B_5. The data collected on June 11, 1975 were somewhat lower than that observed during the period May 21-23, 1975.

3.45 Generally, the data indicate that the NAVSUBASE ship-board sewage discharges are causing a localized impact on the Thames River. It is recognized that the NAVSUBASE sewage contribution adds to the cumulative impact on the Thames River. However, this source of pollution is considered short term; ship-to-shore sewage connections are now under construction and are to be completed in Fiscal Year 1976.

3.46 Biological Character. On May 21-23 and August 15-18, 1975, benthic samples were collected to assess the biological character of project sediments and field observations were recorded of sample appearance (fig. 3-1, table 3-12). In the laboratory, the samples were sorted, counted, and classified to phyla (table 3-13). The results were normalized to numbers of organisms per square foot. In some instances

TABLE 3-11 BACTERIOLOGICAL ANALYSES OF THAMES RIVER SEDIMENTS
NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

SAMPLE STATIONS	DATE	TIME	TIDAL CONDITIONS	*TOTAL COLIFORMS	*FECAL COLIFORMS	*FECAL STREPTOCOCCUS	*STAPHYLOCOCCUS	SALMONELLA
				(Bacteria/Gram of Wet Sediments)				
B_1	6/11	0930	Flood	290	11	5	17	10
B_2	6/11	0940	Flood	290	17	5	41	17
B_3	6/11	0950	Flood	320	8	2	72	10
B_4	6/11	1000	Flood	425	11	16	32	10
B_5	6/11	1010	Flood	480	16	7	38	14
B_6	6/11	1020	Flood	425	31	4	35	8
B_7	6/11	1030	Flood	364	16	6	34	3
B_8	6/11	1040	Flood	310	10	3	25	7
B_9	6/11	1050	Flood	235	80	15	44	5
B_{10}	6/11	1100	Flood	145	1	3	20	27

$B_1 - B_{10}$ = Upstream

Samples Collected June 11, 1975

*Average of Two Replicates

TABLE **3-12** DESCRIPTION OF BENTHIC MATERIAL AFTER SCREENING AND WASHING BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

Station	Description
3S	Very small amount of material; mostly shell fragments from barnacles; 1 small (3-4mm) *Mercenaria mercenaria*; a few dead gastropods; few mussel shells; dead hydroid skeletons; living *Ulva* fragments
3N	Tar in sample; barnacle shells and fragments; dead, small gastropods and pelecypods; fresh water plant fragments
8N	Oil in sample; empty barnacle, mussel, gastropod and pelecypod shells; shell fragments; dead glass sponges; fragments of *Ulva* and a fresh water plant; dead hydroid skeletons
10S	Numerous hydroid skeletons; terrestrial seeds; small, dead gastropods; empty barnacle shells
14S	Fair amount of shell material; mussels, barnacle and angelwing shells; gastropod shells
14N	Large numbers of empty mussel shells, plus other gastropod and pelecypod shells; barnacle shells; pieces of cinders and; 1 small fresh water plant fragment
17N	No living organisms observed; a few gastropod and pelecypod shells; dead hydroid skeletons; barnacle shells; decaying plant material of terrestrial origin
31N	Numerous dead sponges; dead hydroid skeletons; emply gastrcpod, pelecypod and barnacle shells
32N	Oily film in sample; few hydroid skeletons and barnacle shells; many mussel shell fragments; cinders; small pieces of wood
CH.2	Hydroid skeletons; large empty mussel shells, few gastropod shells; one bryozoan skeleton; fresh water plant fragments; many empty *Nuculana tenuisculcata* shells
CH.1	Consisted mainly of empty shells of a small ridged pelecypod; a few fresh water plant fragments

Collected May 21 - 23, 1975 using Petersen Grab

TABLE 3-13 BENTHIC ORGANISMS PER SQUARE FOOT BERTHING AREAS AND CHANNEL EXTENSION NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT.

SAMPLE LOCATIONS

ORGANISMS	3N	3S	8N	10S	14N	14S	17S	31N	32N	CH.2	CH.1	1	2	3	4	5	6	7
Porifera	2																	
Hydrozoa - Polyp			1		3													
Actiniaria			5		3	2												
Rhynchocoela						2												
Polychaeta	3		5		31	2				2		5	2					9
Polychaeta - Tubes	2				6	1	1	1	1	14						1		2
Pelecypodia										14	1	7	12		7	25	5	16
Cirripedia			1															
Brachyura						1												
Asteroidea			2															
Amphipoda													2					
Paguridae															2			

PHASE I — PHASE II

N = North S = South

Samples collected May 21 - 23, 1975
and August 15 - 18, 1975

only dead animal remains such as shell, or hydroid skeletons were found. In other instances, relatively few live animals of few species were found. In all, the stations show no trend in the benthos populations and the rather sparse samples are indicative of the extreme adverse environmental conditions existing in the river sediments.

3.47 Radiological Character. The U.S. Navy has conducted periodic radiological environmental monitoring surveys in the Thames River to provide additional assurance that procedures used by the Navy are adequate to control radioactivity associated with Navy nuclear propulsion plants. Results of these Navy surveys have been checked by a U.S. Atomic Energy laboratory (now U.S. Energy Research and Development Administration). These surveys include quarterly analyses of harbor bottom sediment. In addition, independent surveys have been conducted and reported by a laboratory of the U.S. Environmental Protection Agency. The reports issued by the Navy and the Environmental Protection Agency have been used to assess the radiological effect of the proposed Thames River dredging at the Naval Submarine base.

3.48 Results of Navy radiological environmental monitoring programs are published annually by the Naval Sea Systems Command. The latest of these reports, NT-75-1, May 1975 (ref. 256), includes results for monitoring during 1974 in the Thames River at the Naval Submarine Base. The results of the Environmental Protection Agency survey in 1972 are also published (ref. 241). The results of the environmental monitoring show very low levels of cobalt 60 radioactivity in river

bottom sediment samples from localized areas around ship berthing locations. Approximately 90 percent of the proposed dredging will be in the main river channel.

3.49 The remaining ten percent of the total amount of bottom sediment is to be removed from the area near the piers of the Naval Submarine Base. Based upon U.S. Navy and U.S. EPA survey results the concentrations of cobalt 60 radioactivity in the sediment to be removed from the area around the base average less than 3 picocuries per gram, and the total amount of sediment to be removed contains less than 0.1 curie of cobalt 60.

3.50 Although the point to point concentration is quite variable, and has been noted up to 13.8 pc/gram at one point (ref. 241), the average value is more important for assessing the radiological significance of the dredging. As a measure of the significance of these low levels, a person could continuously consume food containing 30 picocuries per gram cobalt 60 without exceeding the internal exposure standards for the public recommended by the National Council on Radiation Protection and Measurements. Furthermore, this radioactivity is in the form of insoluble metal oxides which do not appear to be assimilated in the food chain, according to EPA report (ref. 241).

3.51 Therefore the small amount of radioactivity in the sediment to be removed will be of no significance and will have no effect on the environment during or after the dredging operations, regardless of the location for disposal of sediment.

3.52 Elutriate Analyses. Elutriate analyses of project spoils have been conducted on composite samples collected from both the New London Dumping Ground waters and the "East Hole" contingency site waters in accordance with latest EPA criteria 1973 (ref. 240). As stated in section 227.61, paragraph C of those regulations, spoil can be classified as unpolluted, "if it (dredged material) produces a standard elutriate in which the concentration of no major constituent is more than 1.5 times the concentration of the same constituent in the water from the proposed disposal site used." Concentrations of major constituents are presented in accordance with this statement. Baseline concentrations were multiplied by a factor of 1.5 and presented as EPA criteria (tables 3-14 through 3-17). The 1.5 factor is open to interpretation. This factor is largely dependent on the concentrations of chemical constituents measured in the water baseline at the time of the test. Although the 1.5 factor is exceeded in only some cases, the spoil is considered polluted under the 1973 criteria. It is recognized that the elutriate analysis is an empirical test and that this test was designed to simulate the conditions of a working hydraulic dredge (ref. 120). Therefore, results of the elutriate test should not be relied upon to accurately evaluate dredged material for ocean disposal.

3.53 The chemical and physical characteristics of the New London Dumping Ground waters and the "East Hole" contingency site waters are similar due to their proximate locations. Therefore, similar concentrations of chemical constituents in the water baselines for

TABLE 3-14 ELUTRIATE ANALYSES OF SPOIL FROM BERTHING AREAS AND CHANNEL EXTENSION USING WATER FROM THE NEW LONDON DUMPING GROUND NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

PHASE I

Sample Station	COD_1	COD_2	Total Nitrogen	Total Phosphorus	NO_3	Hg	Pb	Zn	Cd	Cu	Cr	Phenol	DDT	PCB
	Milligrams/liter (ppm)							Micrograms/liter (ppb)						
NLON Water Base Line	179.7	63.26	0.74	0.66	3.9	2.06		66.18	13.3	6.7	15.7	< 5	<0.1	<0.5
EPA Criteria	269.6	94.9	1.1	.99	5.85	3.09		99.27	19.95	10.05	23.6	<7.5	<.15	<.75
3N TOP	139.8	110.6	11.2	2.04	2.9	0.40		56.0	17.5	17.4	27.7	<5	<0.1	3.4
3S TOP	136.7	76.3	7.8	-	-	0.55		72.2	26.9	12.7	33.1	-	-	-
8N TOP	101.1	77.8	14.3	0.72	5.5	0.51		85.3	30.8	35.0	21.9	< 5	<0.1	0.6
8N MID	225.4	112.8	14.8	0.93	17.1	0.24		78.2	26.9	41.6	19.6	-	-	-
8N BOT	101.1	80.0	12.5	1.58	4.9	0.35		63.9	35.7	23.3	17.8	-	-	-
10N TOP	549.4	140.0	17.3	1.53	3.3	0.26		70.4	27.5	21.7	29.8	< 5	<0.1	1.4
10N MID	190.	91.6	14.8	0.52	2.7	1.06		83.4	25.3	11.8	31.3	-	-	-
10N BOT	150.5	77.3	13.8	1.51	11.2	0.84		85.8	47.7	16.6	36.7	-	-	-
10S TOP	136.7	76.3	7.8	-	-	0.55		72.2	26.9	12.7	33.1	-	-	-
14N TOP	471.9	126.1	12.1	2.03	185.	0.18		81.0	35.3	11.0	20.4	<5	<0.1	0.8
14N MID	473.3	136.5	12.9	1.63	4.9	0.51		63.9	35.7	10.4	21.4	-	-	-
14N BOT	369.9	94.2	12.4	1.41	4.7	0.91		71.5	29.7	14.9	19.5	-	-	-

COD_1 = apparent chemical oxygen demand

COD_2 = corrected for chloride interference

1 ppm = 10^3 ppb

Samples collected May 21-23, 1975

TABLE 3-14 continued

Sample Station	COD_1	COD_2	Total Nitrogen	Total Phosphorus	NO_3	Hg	Pb	Zn	Cd	Cu	Cr	Phenol	DDT	PCB
	Milligrams/liter (ppm)							Micrograms/liter (ppb)						
17S TOP	93.3	61.9	12.3	1.77	2.6	0.48		62.8	26.2	9.0	33.2	8	<0.1	-
17S MID	265.6	92.5	15.3	2.7	12.9	0.29		81.3	23.8	9.7	25.0	-	-	-
17S BOT	263.2	89.2	18.6	2.24	9.9	1.25		94.6	22.2	8.0	25.2	-	-	-
31N TOP	197.6	126.6	12.6	0.73	6.3	0.91		106.0	34.5	10.4	22.7	10	<0.1	<0.5
31N MID	209.5	93.5	11.9	2.91	4.3	0.97		68.2	34.8	10.5	19.7	-	-	-
31N BOT	170.7	108.1	13.2	0.83	7.4	0.84		80.4	32.4	17.0	20.8	-	-	-
32N TOP	177.5	72.7	14.0	1.88	1.8	0.95		60.4	28.0	<3.9	24.8	8	<0.1	0.6
32N MID	244.5	92.5	17.4	1.32	1.3	0.70		72.4	26.2	6.3	22.8	-	-	-
32N BOT	197.2	100.8	19.6	-	-	0.26		59.2	25.1	7.4	30.0	-	-	-
CH.1 TOP	280.4	105.6	10.9	2.16	2.0	0.37		46.7	20.0	11.5	28.7	<5	<0.1	0.8
CH.1 MID	244.1	113.3	13.8	1.37	7.2	3.08		40.8	23.4	22.6	32.4	-	-	-
CH.1 BOT	211.5	95.4	12.4	1.90	4.3	0.33		50.1	17.8	11.4	31.7	-	-	-
CH.2 TOP	89.4	57.7	9.7	2.10	4.6	0.80		50.0	30.1	7.0	33.8	<5	-	-
CH.2 MID	173.8	113.7	17.4	0.68	2.8	1.03		95.7	26.9	12.7	27.1	-	-	-
CH.2 BOT	183.0	85.6	14.2	1.09	2.4	1.43		61.3	32.0	7.6	30.9	-	-	-

COD_1 = apparent chemical oxygen demand

COD_2 = corrected for chloride interference

1 ppm = 10^3 ppb

Samples collected May 21-23, 1975

TABLE 3-15 ELUTIRATE ANALYSES OF SPOIL FROM BERTHING AREAS AND CHANNEL EXTENSION USING WATER FROM THE "EAST HOLE" CONTINGENCY SITE NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

PHASE I

Sample Station	Milligrams/liter (ppm)					Micrograms/liter (ppb)									
	COD_1	COD_2	Total Nitrogen	Total Phosphorus	NO_3	Hg	Pb	Zn	Cd	Cu	Cr	Phenol	DDT	PCB
"East Hole" Water Base Line	283.7	91.8	.62	.51	3.0	2.12		99.85	13.1	21.7	16.7	< 5	<.1	<.5
EPA Criteria	425.6	137.7	.93	.77	4.5	3.18		149.78	19.7	33.6	25.1	< 7.5	<.15	<.75
3N TOP	139.8	110.6	11.2	2.04	2.9	0.40		56.0	17.5	17.4	27.7	< 5	< 0.1	3.4
3S TOP	181.7	90.8	4.8	.94	5.3	.15		65.7	16.3	18.7	20.3	8.0	<.1	.8
8N TOP	136.2	92.5	14.5	1.78	8.0	.91		161.6	12.7	170.7	26.6	8.0	<.1	1.8
8N MID	220.2	97.4	17.9	1.45	3.2	.50		158.5	11.8	106.4	26.8	-	-	-
8N BOT	93.4	80.4	11.2	1.60	1.8	.62		142.4	16.6	31.2	24.2	-	-	-
10N TOP	208.9	87.9	14.1	.71	8.4	.48		87.5	22.6	12.5	22.7	6.0	<.1	.6
10N MID	183.6	93.3	17.0	2.49	12.5	.40		71.0	21.6	12.1	18.4	-	-	-
10N BOT	235.7	106.6	16.5	1.36	9.4	.26		86.6	25.1	16.9	18.6	-	-	-
10S TOP	134.3	81.0	13.1	-	-	1.17		61.5	19.2	10.2	23.9	-	< 0.1	.40
14N TOP	159.7	91.8	14.0	2.81	3.4	1.69		75.8	10.4	17.7	23.5	< 5	< 0.1	0.8
14N MID	164.4	100.8	13.0	1.94	4.2	0.91		93.0	17.0	20.1	20.6	-	-	-
14N BOT	165.2	92.6	11.5	11.5	10.0	0.37		77.6	13.8	22.6	21.1	-	-	-

COD_1 = apparent chemical oxygen demand

COD_2 = corrected for chloride interference

1 ppm = 10^3 ppb

Samples collected May 21-23, 1975

TABLE 3-15 continued

Sample Station	COD_1	COD_2	Total Nitrogen	Total Phosphorus	NO_3	Hg	Pb	Zn	Cd	Cu	Cr	Phenol	DDT	PCB
	Milligrams/liter (ppm)							Micrograms/liter (ppb)						
17S TOP	180.2	76.1	12.3	1.47	2.9	1.77		107.7	18.7	12.8	26.3	<5	<0.1	<0.5
17S MID	155.7	81.7	17.9	1.28	5.1	0.60		82.5	19.5	20.4	24.5	-	-	-
17S BOT	137.5	82.6	15.8	2.38	5.4	0.17		61.4	24.7	16.9	26.6	-	-	-
31N TOP	124.5	83.6	13.7	1.54	1.1	0.79		58.0	15.7	44.0	25.6	<5	<0.1	-
31N MID	152.5	110.7	16.7	-	-	0.24		36.0	16.1	18.9	25.6	-	-	-
31N BOT	124.5	104.0	17.3	1.02	3.2	0.70		10.2	19.6	24.1	26.8	-	-	-
32N TOP	319.5	93.7	13.2	2.04	3.2	0.62		64.8	24.6	6.6	25.3	6	<0.1	0.6
32N MID	441.7	140.9	17.0	1.16	7.2	0.37		63.1	22.8	9.4	23.6	-	-	-
32N BOT	250.8	123.1	20.5	1.72	3.50	0.62		62.1	20.7	12.4	23.7	-	-	-
CH.1 TOP	173.8	96.4	10.3	1.02	5.6	0.33		79.6	19.6	10.7	24.3	10	0.1	0.8
CH.1 MID	611.6	129.4	10.8	1.50	12.8	0.26		71.7	22.7	14.9	20.5	-	-	-
CH.1 BOT	193.5	105.2	11.5	1.0	3.7	0.51		88.6	24.7	16.9	22.1	-	-	-
CH.2 TOP	496.9	131.4	9.9	1.30	8.9	0.88		80.8	11.4	16.6	23.6	12	<0.1	0.7
CH.2 MID	205.9	108.2	17.0	2.94	1.0	0.18		86.6	11.7	12.8	21.6	-	-	-
CH.2 BOT	209.5	96.9	11.9	1.67	8.2	0.55		74.6	17.5	9.2	25.6	-	-	-

COD_1 = apparent chemical oxygen demand

COD_2 = corrected for chloride interference

1 ppm = 10^3 ppb

Samples collected May 21-23, 1975

TABLE 3-16 ELUTRIATE ANALYSES OF SPOIL FROM BERTHING AREAS AND CHANNEL EXTENSION USING WATER FROM THE NEW LONDON DUMPING GROUND NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT
PHASE II

Sample Station	COD_1	COD_2	Milligrams/liter (ppm) Total Nitrogen	Total Phosphorus	NO_3	Oil/ Grease	Phenol	Hg	Pb	Micrograms/liter (ppb) Zn	Cd	Cu	Cr	DDT	PCB
NLON Water Base Line	159.5	90.1	.64	.06	0.1	1.5	<.005	1.89		<12	6.2	9.6	<8	<0.1	<.5
EPA Criteria	237.8	135.2	.96	.09	.15	2.25	--	2.84		<18	<12	14.4	<12	--	--
1 TOP	154.9	62.1	11.3	1.66	.6	2.3	.13	10.0		<12	<12	<6	<8	<0.1	1.8
1 CEN	169.5	94.3	25.4	2.06	.6	2.1	.34	.61		<12	<12	<6	<8	<0.1	.9
2 TOP	122.2	56.6	5.9	0.90	.2	1.8	.005	1.51		<12	<12	7.4	<8	<0.1	<.5
2 CEN	225.6	110.1	16.4	2.44	.2	1.9	.02	1.63		<13.7	<12	10.9	<8	<0.1	1.2
3 TOP	131.6	70.8	13.1	0.22	.1	2.1	.35	1.01		<12	<12	<6	<8	<0.1	2.0
3 CEN	138.4	64.8	16.9	1.40	.1	2.3	.02	.94		<12	<12	8.9	<8	<0.1	1.8
4 TOP	133.9	42.7	13.5	2.24	.1	1.8	.40	2.48		<12	<12	<6	13.5	<0.1	.6
4 CEN	157.2	59.6	16.6	2.20	.1	2.2	.22	1.71		<12	<12	<6	21.6	<0.1	2.2
5 TOP	126.1	39.1	6.8	.84	.2	1.9	.02	2.48		<12.5	<12	<6	9.2	<0.1	1.0
5 CEN	157.2	67.6	25.0	2.40	.2	2.4	<.005	2.09		<12	<12	<6	<8	<0.1	1.8
6 TOP	110.6	62.3	8.8	1.14	.1	1.9	.35	9.98		71.9	<12	<6	12.2	<0.1	<.5
6 CEN	154.9	81.3	22.0	1.68	.1	2.0	.21	1.08		<12	<12	<6	11.5	<0.1	1.0
7 TOP	142.9	73.1	8.8	1.76	.1	2.2	.01	1.41		<12	<12	<6	12.7	<0.1	.9
7 CEN	206.2	110.0	19.7	1.80	.1	1.9	<.005	2.00		<12	<12	<6	<8	<0.1	<.5

Samples collected August 15-18, 1975

TABLE 3-17 ELUTRIATE ANALYSES OF SPOIL FROM BERTHING AREAS AND CHANNEL EXTENSION USING WATER FROM THE "EAST HOLE" CONTINGENCY SITE NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

PHASE II

	Milligrams/liter (ppm)							Micrograms/liter (ppb)							
Sample Station	COD_1	COD_2	Total Nitrogen	Total Phosphorus	NO_3	Oil/ Grease	Phenol	Hg	Pb	Zn	Cd	Cu	Cr	DDT	PCB
East Hole Water Base Line	118.4	49.6	1.4	.05	0.1	1.6	<.005	2.88		<12	<12	<6	<8	<0.1	<0.5
EPA Criteria	177.6	74.4	2.1	.08	.15	2.4	--	4.32		18	18	9	12	<0.1	--
1 TOP	139	72.4	14.9	.78	0.1	1.8	<.005	7.68		<12	<12	<6	<8	<0.1	<0.5
1 CEN	140.6	91.3	24.6	2.04	0.1	1.6	.02	12.9		<12	<12	<6	<8	<0.1	<0.5
2 TOP	118.3	57.5	6.5	1.08	0.1	2.0	<.005	12.9		<12	<12	<6	<8	<0.1	0.8
2 CEN	139.1	75.1	18.0	2.28	0.1	2.1	<.005	7.04		<12	<12	<6	<8	<0.1	0.7
3 TOP	116.6	73.5	10.8	.06	0.1	1.9	.01	3.18		<12	<12	<6	14.7	<0.1	0.6
3 CEN	123	68.0	16.0	1.20	0.1	2.2	.01	3.64		<12	<12	<6	13.8	<0.1	1.7
4 TOP	235	71.8	12.9	1.74	0.1	1.6	.02	1.65		<12	<12	<6	9.8	<0.1	0.9
4 CEN	165	175.8	32.8	2.76	0.1	2.3	.01	3.41		<12	<12	<6	<8	<0.1	0.7
5 TOP	118.3	33.5	6.2	.90	0.1	2.0	.01	4.14		<12	<12	<6	<8	<0.1	<0.5
5 CEN	158	41.2	16.6	1.50	0.1	2.1	.03	4.67		<12	<12	<6	9.0	<0.1	1.2
6 TOP	195.3	60.4	9.8	1.08	0.1	1.8	.01	2.21		<12	<12	<6	<8	<0.1	<0.5
6 CEN	163.4	83.3	22.3	1.74	0.1	1.8	.01	4.44		<12	<12	<6	<8	<0.1	0.6
7 TOP	142.2	69.6	11.4	2.04	0.1	2.4	.01	4.11		<12	<12	<6	<8	<0.1	0.7
7 CEN		92.3	24.6	2.28	0.1	1.9	<.005	1.43		<12	<12	<6	<8	<0.1	<0.5

each of these sites were expected and observed. Elutriate samples were collected during two sampling phases (I and II), on May 21-23 and August 15-18, 1975, respectively.

3.54 During May and August 1975, sea water samples collected from the New London Dumping Ground and the "East Hole" in support of the project's elutriate analyses detected lead values in excess of 100 ppb, which is the known solubility limit for lead in sea water. Although concentrations above 100 ppb are highly unlikely and the problems associated with lead analysis of sea water samples are well documented in the literature (see Appendix J), additional studies were undertaken to determine the reliability of the lead values detected in disposal site waters. Point sources, methods of sampling, sampling containers, sample preparation and analytical techniques were considered. The results of this study are presented in Appendix J. Since the elutriate lead values are questionable these data are not presented or evaluated as a constituent of project spoils. Provisions are being made, however, to incorporate water column lead analysis into the on-going monitoring program.

3.55 A three way classification analysis of variance was conducted on elutriate results of several parameters to determine if there was a significant difference between elutriates tested in New London dump site water vs. East Hole water (ref. 67). The results of these tests are presented in table 3-18. Of the six parameters tested, five were determined not to be significantly different. Each of the parameters

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TABLE 3-18 STATISTICAL TEST FOR SIGNIFICANCE OF DISPOSAL SITE LOCATIONS

	COD	Total Nitrogen	NO_3	Phosphorus	Pb	Hg
$\bar{x}$ New London	87	14.3	2.80	1.6	408	1.78
$\bar{x}$ East Hole	86	15.2	3.03	1.6	358	2.94
Significance 5%					+	
Not Significant	+	+	+	+		+

NOTE: Significance at 5% level - 95% confidance limit

Volatile Solids = % Dry Weight
All Other Parameters = ppb

tested had an N value equal to 120. These data points came from 15 stations, 2 depths, and 2 replicates for each combination for both (2) receiving waters (15 x 2 x 2 x 2 = 120).

3.56 Two noteworthy considerations were demonstrated by the statistics; (1) triplicate analyses are unnecessary, and (2) sums of squares showed no significant differences between the means of top, middle and bottom sections tested for heavy metal elutriates, at all stations. Thus, the number of analyses may be reduced for future sampling.

3.57 PROPOSED OCEAN DISPOSAL SITE, General: The New London Site is one nautical mile square with sides running true north-south and east-west. The coordinates of its center are 41° 16.3' North, 72° 04.6' West, and it is 2.5 nautical miles south of the mouth of the Thames River. The dumping ground occupies a shallow depression, which originally had an average depth of about 70 feet. Much of the site is still about 70 feet deep, but Navy spoil disposal, which terminated in December of 1974, has created a broad flat mound in the southwest corner of the area with a depth of 58 feet (See Appendix K).

3.58 Sediments. At the present time, bottom sediments at the New London Site consist primarily of dredge spoil from the 1st increment of Navy Thames River dredging. Underwater television studies by Morton et al. (ref. 140) reveal two distinct types of sediments on top of the spoil pile. A fairly thin layer of fine silt, which when disturbed immediately goes into suspension, covers most of the surface. Below

this thin layer, the sediment becomes more cohesive. The other surface consists of small gravel stones and shell fragments. The boundary between these two types of surface is sharp and forms linear features tens of feet in length. The coarse material extends to some depth. The origin of these coarse deposits has not fully been resolved, but it appears that they may be coarse spoils, rather than a lag deposit left from a winnowing out of fines.

3.59 Large cohesive lumps of material were noticed at various places on the spoil dump, ranging in size up to 3 meters in diameter. Based on the results of their studies, Morton et al. (ref. 140), conclude that, "the surface of the spoil pile has some limited erosion and deposition processes occurring; but that, in general, the cohesive nature of the dredge sediment spoils themselves prevents any major erosion and transportation of material."

3.60 Bathymetric surveys of the dredge spoil pile show that at this time the pile is an elliptical mound approximately 400 x 800 yards in size. Repeated surveys have shown initial settling and spreading shortly after dumping; however, the pile now seems to have stabilized.

3.61 Currents. Morton et al. (ref. 140) have treated the currents at the New London site in considerable detail. They have related near-bottom current velocities to the friction velocity and threshold friction velocity necessary to erode and transport sediments characteristic of the New London dredging. The calculations required to convert near-

bottom current velocity to threshold friction velocity are detailed in their paper. The long term current regime as well as short term turbulent current fluctuations within one meter from the bottom were measured. Flume tank studies carried out by the Massachusetts Maritime Academy to determine the near-bottom current velocity necessary to erode and transport Thames River dredge spoils show that at 0.5 feet above the bottom a velocity of 1.75 ft/sec is necessary to erode the sediment (ref. 144). This was calculated by Morton to represent a threshold friction velocity of 0.13 ft/sec. By using this figure, it is possible to compare field current measurements, converted to friction velocity, with laboratory results for threshold friction velocity. It may be assumed that friction velocities in excess of 0.13 ft/sec would result in erosion and transport of sediments.

3.62 Data presented by Morton (140) indicate friction velocities for the New London Site average 0.05 ft/sec. These results show that the friction velocities encountered are substantially less than those required to erode the spoil material.

3.63 Based on the calculations and observations made at the New London Site, it appears that the current pattern for the site is one of periodic tidal reversals super-imposed on a mean flow toward the ESE. Friction velocities have not been observed which would result in the erosion and transport of the dredged sediment. Morton et al. conclude that "the spoils showed initial settling and spreading during the period immediately following dumping, but now appear to have stabilized."

Additionally, they find that "The general character of the bottom indicates that there may be some winnowing of fine material, but generally the cohesive nature of the dredge spoil restricts significant erosion processes."

3.64 The New London Site lies in the Summary of Synoptic Meteorological Observations (SSMO, ref. 247) Zone 6, where peak expected waves range from 26 to 32 feet high, with a period of nine to eleven seconds. Ninety percent of the waves are six feet or less in amplitude and have an associated period of six seconds. The bottom velocity induced by these 90% waves is 0.6 feet per second. They would induce a bottom velocity of 1.7 feet per second (the erosion velocity of Thames River sediments) at a depth of 40 feet. This theoretically allows 30 feet of spoils to be placed on the site, for a comparative capacity of 41 million cubic yards.

3.65 Biological Characteristics. The biology of this site has also been extensively monitored in connection with the Navy spoil disposal operation. Several different benthic faunal assemblages were recognized within the area of the New London Site. The dredge spoil sediments and the natural sandy-silt sediments support the different assemblages. The dredge spoil is undergoing recolonization and equilibrium has not yet been reached. As of the latest MACFC Quarterly Report (ref. 232), the dredge spoils support a diverse group of organisms. The small bivalve, Nucula proxima, comprised the majority of individuals; other organisms included Nepthys proxima, N. incisa and Pagurus longi-

carpus. In some areas within and surrounding the site, sediments were composed of sandy-silt which is characteristic of New London sediments. Abundant organisms from these sediments included Ampelisca, Leptocheirus, Clymenella spp. and Nucula proxima. This faunal assemblage was similar to those found in sandy-silt sediments throughout Long Island Sound.

3.66 Fisheries. The commercial trawl fishery in this area is limited. Fishermen specifically avoid the site itself and the surrounding area. The extent of a trawl and seine fishery further into Long Island Sound is discussed under the Niantic, Orient Point and Cornfield Shoals Sites in Section 6. Sport fishing for flounder, fluke, striped bass, and bluefish is common but certainly not as extensive as other nearby areas, such as the Race. The River itself has bluefish, mackerel, striped bass, smelt, anadromous runs of glut herring and alewifes. Young of-the-year menhaden are also found. Black sea bass, fluke and winter flounder are found in Fishers Island Sound and waters off the New London Light. In the course of the spoil disposal monitoring studies, finfish sampling has been conducted and the following species of fish have been found in and around the site: fluke, little skate, windowpane, winter flounder, scup, planehead filefish, cunner, tautog, northern searobin, butterfish, rock gunnel, longhorm sculpin, sea raven, grubby, red hake, ocean pout, alewife, hogchoker, smelt, Atlantic silverside, and American sand lance. Of the above, winter flounder, longhorn sculpin, and skate were most abundant.

3.67 A small lobster fishery exists in the River itself. Sets of pots, however, become heavier on offshore shoals and ledges towards Niantic, Avery Point, Pine Island, and Fishers Island. The catch statistics for the New London Site area itself are not known, but the monitoring studies have reported lobsters to be inhabiting the spoil pile. The only shellfish harvesting known to be conducted in the area is scalloping in Fishers Island and shallow bays near Pine Island. Although quahaug and oyster beds exist in the area, harvesting is restricted due to water pollution. Harvesting was resticted even prior to the initial dredging.

4. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

4.01 GENERAL. Areas affected by the proposed action (see Section 2) consist of submerged lands which will be dredged and on which dredged material will be disposed. Plans, Policies, and Controls on the use of these lands may be segregated for evaluation purposes into: Federal Statutes, Regulations, Plans, and International Agreements (see table 4-1); State Statutes, Plans, and Policies (see table 4-2); and Regional Plans and Policies (see table 4-2).

4.02 FEDERAL STATUTES. Section 10 of the Rivers and Harbors Act of 1899 (33 USC 401) prohibits the unauthorized obstruction or alteration of any navigable water of the United States unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. A permit for dredging and dredge material disposal for Projects P-112, P-145 and P-152 (channel extension) as indicated in table 2-1 was requested from the New England Division, Corps of Engineers on September 9, 1975. Permits for the remaining projects will be requested upon project funding.

4.03 The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500; 86 Stat. 816) or FWPCA, provides protection against unregulated dumping of wastes in the waters of the United States. Section 404 of FWPCA authorizes the U.S. Army Corps of Engineers to publish guidelines to govern disposal of wastes into navigable waters at specified disposal sites. Further, this section authorizes the Admin-

TABLE 4-1 SUMMARY OF FEDERAL REGULATIONS
STATUTES, REGULATIONS AND POLICIES
INFLUENCING NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT

Regulatory Level and Agency	Statute, Regulation or Policy	Environmental Concern	Regulatory Effect	Commentary
FEDERAL				
All Federal Agencies	1958 Convention on the Territorial Sea and the Contiguous Zone (15 U.S.T. 1606; T.I.A.S. 5639)	None	Establishes limits of Territorial Sea and Contiguous Zone.	Regulations on dumping in navigable and ocean waters are based on limits defined in the Convention.
All Federal Agencies	1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	Protection of the Marine Environment	Requires signatory nations to establish permit provedures to regulate dumping in the sea. Provides criteria for evaluation of Permit requests.	EPA Ocean Dumping Regulations (40 CFR 220-227) were enacted in response to this Convention, the requirements of Title I of the Marine Protection Research and Sanctuaries Act (P.L. 92-532)

TABLE 4-1 (CONTINUED)

U. S. Department of Commerce	Marine Protection, Research and Sanctuaries Act (86 Stat 1052; 33 USC 1413)			
	Section 302	Protection of Ocean Waters	Secretary of Commerce may designate Marine Sanctuaries, and regulate activities in them.	No Marine Sanctuaries have been designated in the waters of Connecticut, New York, or Rhode Island.
U. S. Army Corps of Engineers/ Environmental Protection Agency	Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500)			
	Section 404	Spoil disposal in navigable waters	Army may issue permits for discharge of dredged or fill material into navigable waters at specified disposal sites. Disposal sites will be selected in accordance with guidelines established by EPA in conjunction with the Army.	Affects the proposed action. EPA may prohibit use of a disposal site if use would cause unacceptable adverse impact to municipal water supplies, shellfish and fishery areas, wildlife or recreation areas.
All Federal Agencies	Coastal Zone (Management Act 86 Stat 1280)	Compliance with Coastal Zone Management Activities	Compliance with State Coastal Zone Management Activities.	See discussion under "State Coastal Zone Management Agency", below.

U.S. Army Corps of Engineers	River and Harbor Act of 1899 (30 Stat. 1151; 33 USC 401)			
	Section 10	Protection of Navigable Waters	Construction, excavation or deposition of materials, or any other work affecting navigable waters requires Army authorization.	Section 10 affects the propos action.
	Section 13	Protection of Navigable Waters	Section 13 authorized the Army to issue permits for dumping refuse in navigable waters. See Commentary.	Not applicable. The Army permit authority has been superceded by EPA authority under Sections 402 and 405 of Federal Water Pollution Control Act (86 Stat. 816; 33 USC 1342 and 1345)
U. S. Army Corps of Engineers	Marine Protection, Research and Sanctuaries Act (86 Stat 1052; 33 USC 1413)			
	Section 103	Protection of Ocean Waters	Army may issue permits to transport dredged material in order to dump it in ocean waters.	Affects several alternatives to the proposed action. EPA may prohibit issuance of the permit if dumping of the material will result in an unacceptable adverse impact to municipal water supplies shellfish and fishery areas, wildlife or recreation areas.

TABLE 4-1 (CONTINUED)

U. S. Army Corps of Engineers	New York Act of 1888 (33 USC 441 et seq.)	Spoil disposal in areas governed by Supervisor of New York Harbor	Formerly, Army issued permits for disposal of spoils in the Harbor. See Commentary.	Permit authority is superceded by Section 511 of the Federal Water Pollution Control Act and Section 106(a) of the Marine Protection, search and Sanctuaries Act.
U.S. Fish and Wildlife Service or National Marine Fisheries Service, as appropriate	Fish and Wildlife Coordination Act (16 USC 661-66c)	Protection of Surface Waters **and fish and wildlife habitat.**	Any Federal agency wishing to control or modify a wetland or body of water must consult with USF&WS or NMFS, as appropriate, and with state wildlife agencies.	Affects the proposed action. Purpose of consultation is to identify potential impacts to wildlife and explore measures to minimize harm.
U. S. Advisory Council on Historic Preservation	National Historic Preservation Act of 1966 (80 Stat 915; 16 USC 470)	Protection of properties listed in National Register of Historic Places	Council reviews and comments on activities licensed by Federal government which will affect National Register properties.	Connecticut Historical Commission currently investigating project site.
All Federal Agencies	Water Resources Planning Act (42 USC 1962 et seq.)	Coordination of Federal Activities with state and local water resource planning.	Federal permits of activities which will affect river basin plans must be coordinated with the appropriate river basin commission.	No conflicts were found between the proposed action and Thames River basin planning activities.

TABLE 4-1 (CONTINUED)

U.S. Department of Interior	Endangered Species Act (16 USC 668aa to 668cc-6)	Protection of endangered wildlife species or those threatened by extinction.	Protects species officially listed as endangered by Department of Interiors.	No officially listed species are felt to be threatened by the project.

istrator of EPA to prohibit the use of any area as a disposal area if evaluation of the impact of the action on the environment shows that certain unacceptable adverse effects will occur. The area of this jurisdiction includes all waters shoreward of the baseline from which the territorial sea is measured. Regulations published pursuant to Section 404 of FWPCA are discussed in paragraphs 4.10 and 4.11 of this report.

4.04 While two different sets of regulations (those for navigable waters and those for ocean waters) are authorized by FWPCA to govern discharges, the Act states that the criteria on which both sets of regulations are based are to be "comparable" (Section 404(b) of FWPCA). Use of FWPCA in determining dredge material disposal sites is developed in Section 11 of this Supplement.

4.05 Section 106 of the National Historic Preservation Act of 1966 (PL 89-665, 80 Stat. 915), in an effort to safeguard properties of possible historical or cultural significance, requires Federal Agencies to take into account the effect of any action on these properties. Examination of the National Register of Historic Places and preliminary field reconnaisance have not revealed any such properties which might be influenced by the proposed action. Nonetheless, the Connecticut Historical and Archeological Commissions are currently conducting field surveys of sites which may be affected by the proposed action. Results of these field investigations are expected during the Commissions' review of the Draft Supplement.

4.06 The Coastal Zone Management (CZM) Act (PL 92-583; 86 Stat. 1280) affirms a national interest in the effective management, beneficial use, protection, and development of the coastal zone, and provides assistance and encouragement to the coastal states to develop and implement rational programs for managing their coastal zones. Three financial assistance grant programs are authorized by the Act. Section 305 authorizes annual grants to assist any United States coastal state or territory in the development of a Coastal Zone Management Plan for the land and water resources of its coastal zone (program development grants). Under Section 306, after developing a management program, the state may submit it to the Secretary of Commerce for approval; if approved, the state is then eligible for annual grants to administer its management program. Finally, Section 312 provides grants for an estuarine sanctuary program, to preserve a representative series of undisturbed estuarine areas for long-term scientific and educational purposes. The status of the Connecticut Coastal Zone Management Plan is presented in paragraphs 4.22 and 4.23 below.

4.07 INTERNATIONAL AGREEMENTS. The 1958 Convention on the Territorial Sea and the Contiguous Zone (15 U.S.T. 1606; T.I.A.S. 5639) defines the limits of the territorial sea and the contiguous zone and specifies the authority adjacent coastal nations may exercise in those areas as well as the rights of foreign vessels in those areas. The Convention's definitions of territorial sea and contiguous zone, and its demarcation of the baseline from which both are measured, apply to the statutes and regulations governing disposal of dredged materials in ocean and navigable waters.

All areas affected by the proposed action are located within navigable waters.

4.08 FEDERAL REGULATIONS. The Army Corps of Engineers recently published regulations [33 CFR 209.120; July 25, 1975, "Permits for Activities in Navigable Waters and Ocean Waters"] which establish procedures by which it will administer permits for dredging, spoil disposal, and transporting materials for spoil disposal in the waters of the United States. Specifically, the permit authority extends to "...applications for permits authorizing structures in or affecting navigable waters of the United States, the discharge of dredged or fill material into navigable waters, and the transportation of dredged material for the purpose of dumping it into ocean waters." These administrative regulations consolidate the several permit and review procedures of the statutes described above into a single application procedure, the scope of which reflects the broad range of concerns of the statutes. A very extensive list of considerations is provided for use by the District Engineer in his deliberations on a permit application. This list also includes, by reference, guidelines and criteria established by the U.S. Environmental Protection Agency to govern disposal of dredge spoils and other wastes in navigable and ocean waters. These guidelines are discussed in paragraphs 4.10, 4.11 and 6.121 - 6.133.

4.09 <u>Review of Permit Applications</u>: The regulations list many general concerns to be addressed by the Corps of Engineers. Those most relevant to the proposed Navy project include:

- Consideration of State, regional or local land use classifications or policies on land or water areas under consideration;
- Interference with adjacent properties or water resource projects;
- Effect on Wetlands;
- Effect on fish and wildlife resources;
- Protection of water quality;
- Historic, scenic and recreational values;
- Effect on limits of the territorial sea;
- Effect on State coastal zone management activities or established Marine Sanctuaries.

4.10 Regulations published by the EPA [40 CFR 230; F.R. September 5, 1975, "Navigable Waters, Discharge of Dredged or Fill Material"] will be used by the Corps of Engineers in reviewing permit applications for disposal of dredged materials into navigable waters at specific disposal sites. For the purpose of these regulations, "navigable waters" are defined as all navigable waters shoreward of the baseline from which the territorial sea is measured. Even though strict application of these regulations may seem to preclude the use of a site, such a site may be considered acceptable should the economic effects of such a prohibition be excessively large.

4.11 The Administrator of EPA has the authority to override a District Engineer's permit approval if he determines that the permitted action will have an unacceptable adverse effect on:

- Municipal water supplies;

- Shellfish beds and fishery areas (including breeding and spawning areas);

- Wildlife or recreation areas.

Other concerns which are voiced in the EPA regulations are:

- Chemical-biological interactive effects;
- Threatened or endangered species;
- Effects on submerged vegetation;
- Effects on food chains and species diversity;
- Effects on the movement of fauna;
- Degradation of aesthetic, recreational and economic values;
- Effects on municipal water supplies.

4.12 Implementation: The Corps of Engineers regulations will be implemented in three sequential phases, depending on the class of water body involved (see fig. 4-1). They are in effect immediately (Phase I) for all navigable waters, including offshore coastal water, and wetlands contiguous or adjacent to them. On July 1, 1976 the regulations will be in effect for primary tributaries to Phase I waters, for wetlands contiguous or adjacent to them, and to lakes greater than 5 acres. This is known as Phase II. On July 1, 1977, the regulations will be in effect for tributaries to Phase II waters upstream to the point where the normal flow is five cubic feet per second or greater. This is known as Phase III.

4.13 FEDERAL PLANS. A Master Plan has been prepared to guide development of the Naval Submarine Base at New London (ref. 252). Such

SECTION 404/FWPCA - 1972
JURISDICTIONS

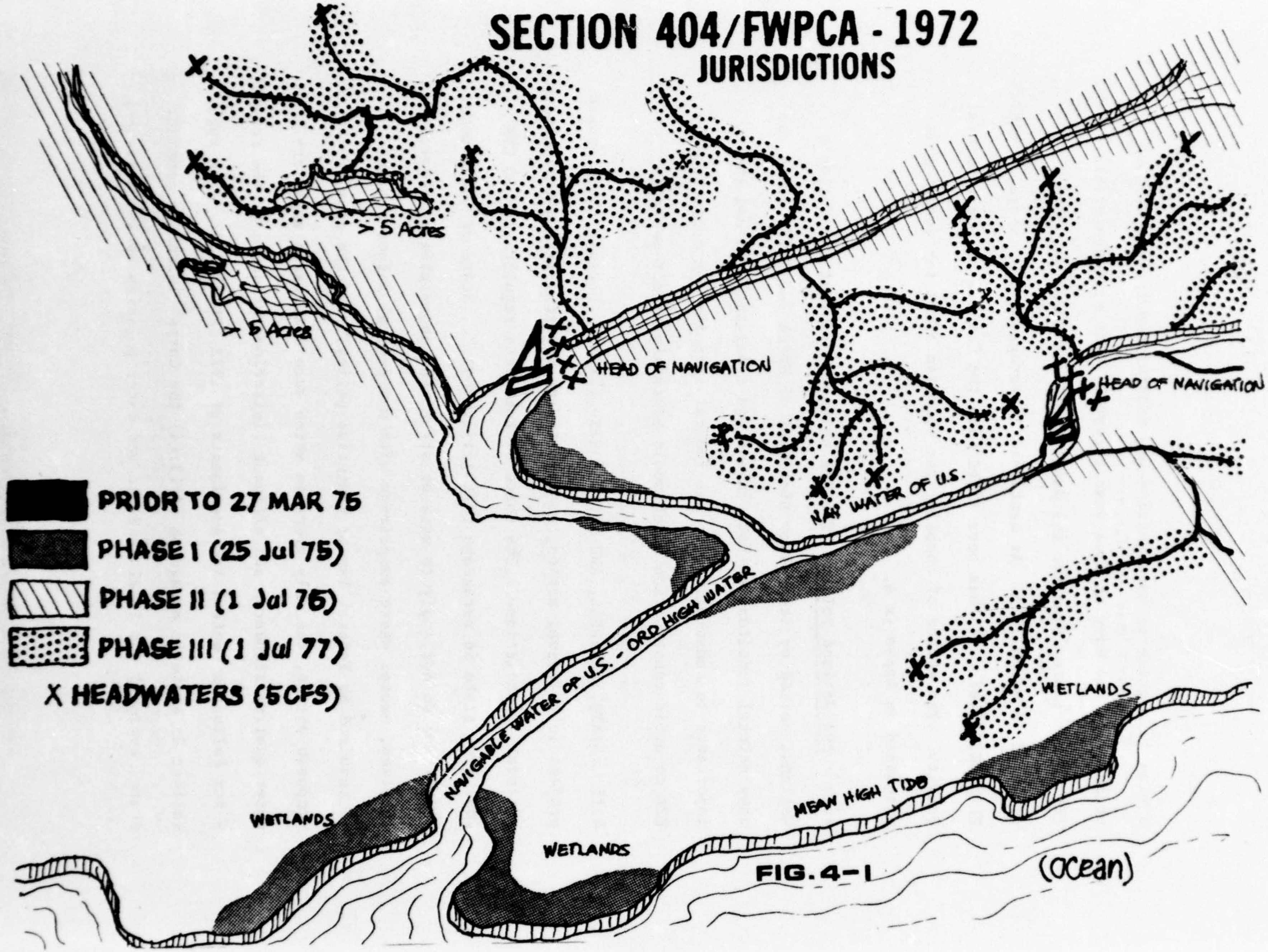


FIG. 4-1

a plan is a guide to construction and rearrangement of facilities prepared by the Navy at five year intervals, for each one of its bases. The latest Master Plan for the Naval Submarine Base, New London, was proposed in March 1973. As mentioned in paragraph 2.02 above, a MASTER PLAN DEIS (ref. 251) has been filed with the Council on Environmental Quality. The method of choosing the specific sites for dredging is discussed in Appendix A.

4.14 EPA Wetland Policy: The EPA policy to protect the Nation's Wetland, voiced by its Policy Statement of March 20, 1973, cites the many natural funcitons of both inland and tidal wetlands and their importance to human welfare. All federal agencies are encouraged by EPA to avoid construction which would adversely effect wetlands.

4.15 STATE, REGIONAL, AND LOCAL JURISDICTIONS. Because the proposed project is a federal action, no permits are required from state, regional or local jurisdictions. The Corps of Engineers regulations, 33 CFR 209. 120, state in paragraph (e)(4)(ii), that "...State or local authorizations do not apply to work or structures undertaken by Federal agencies, except where compliance with non-Federal authorization is required by Federal law or Executive policy." In the case of the proposed action, the only areas in which such compliance apply are water quality standards and effluent limitations mandated by the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). The regulations do state in paragraph (f)(3)(i) the Corps' intent to consider state, regional and local land use and water policies in its decisions

regarding permits. Accordingly, the following sections describe existing law, policies, and plans affecting land and water resources at the regional, state and local levels.

4.16 REGIONAL PLANS AND POLICIES. A major effort on a regional basis to manage both land and water use may be found in the comprehensive Long Island Sound Regional Study (ref. 153), hereinafter referred to as LISS. This study, "A level B water and related land resources study conducted under the provisions of the Water Resources Planning Act of 1965 (PL 89-80)", was completed in July 1975. Under the overall coordination of the New England River Basins Commission, a team of federal, state and regional officials, local citizens and the scientific community developed ten planning reports, i.e. Fish and Wildlife, Flood Damage Reduction, Outdoor Recreation, etc., numerous associated minor reports and finally a Main Report. As concerns land use, only one recommendation was found in the LISS Summary Report which was applicable to the proposed action. That recommendation is:

> "Dredging Policy. New York and Connecticut should assign permanent dredge spoils disposal sites, establish the quality of materials to be dumped there and together with the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers, and the National Oceanic and Atmospheric Administration (NOAA), set up dumping procedures to lessen the environmental harm and monitoring programs to determine the long-term effects of these activities . . . the Corps of Engineers should also study the feasibility and impacts

of the treatment and use of solid waste and dredge spoils to build artificial islands in the Sound for recreation and other purposes."

4.17 Included in the recommendations set forth by the Southeastern Connecticut Regional Planning Agency is the need for port facility improvement at New London. The Regional Transportation Plan for Southeastern Connecticut (ref. 268) states:

"The continuous increase in demand for handling millions of barrels of residual oil is the major problem facing New London harbor. The Long Island Sound study indicates that 75% of the total residual oil received in New London is transshipped by barge to the Dahl Oil Company in Norwich and to power generating plants in Montville, Middletown and Hartford. The projected large volume of petroleum and other cargo, coupled with vast increases in vessel traffic, will demand a greater increase in this improvement, expansion and modernization of the port facilities in New London harbor."

4.18 STATE STATUTES, PLANS AND POLICIES. Connecticut: Sponsors of non-federal dredging and disposal projects must obtain a permit from the State Department of Environmental Protection (DEP). The DEP then circulates permit applications to other state agencies for review. Issuance of the permit is contingent upon obtaining a Water Quality Certificate from the Water Compliance Section of DEP. Land disposal of dredge spoils is evaluated under the same requirements as solid waste disposal. A permit must be requested from the DEP's Solid Waste Management Section and will not be issued until approval is obtained

TABLE 4-2 SUMMARY OF STATE AND REGIONAL ENVIRONMENTAL STATUTES, REGULATIONS AND POLICIES POTENTIALLY INFLUENCING NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CT.

Regulation and Agency	Regulation and/ or Policy	Environmental Concern	Regulatory Effect	Commentary
STATE				
Connecticut Department of Environmental Protection	Federal Law 92.500, Section 401-Water Quality Certificate.	Dredging and Spoil disposal	Requires permit for non-Federal dredging and disposal projects	Not applicable to this project.
	Connecticut General Statutes, Section 19-524(b)	Land disposal of spoil and protection of inland wetlands.	Requires permit for non-Federal disposal projects.	Not applicable to this project.
	Tidal Wetlands Act	Protection of tidal wetlands	Requires permit for non-Federal projects and may require an erosion control plan.	Not applicable to this project.
	Coastal Zone Management Plan	Coastal management and protection	Plan not yet completed	No conflict with this project forseen.
Connecticut Department of Transportation	Connecticut Master Transportation Plan			Not applicable to this project.

Connecticut Department of Planning	A plan of Conservation and Development for Connecticut.	Construction on Long Island Sound.	Requires consideration of environmental impact.	Not applicable to
Connecticut Department of Environmental Protection	Statewide Comprehensive Outdoor Recreation Plan.			Not applicable to this project.
Rhode Island Coastal Resources Management Council	Coastal Resources Management Council Plan-Policies and Regulations, Chapter 9 "Dredging and Filling"	Coastal Management and protection	Requires a permit for dredging or filling in tidal waters.	Only applicable to dumping in Rhode Island waters.
REGIONAL				
New England River Basins Commission	Long Island Sound Regional Study	Potential water-related impacts.	A dredging policy	No conflict with this project.

from the local body which administers inland wetlands. Depending on the particular municipality, this body may be a conservation commission, a zoning commission, or another commission specially established for the purpose. Tidal wetlands are also regulated by the DEP. Current policy is to prohibit any use of such areas which would degrade or destroy them. Because the Tidal Wetlands Act (Section 22a-28 through 22a-35 of the 1975 Revisions of the Connecticut General Statutes) regulates effects on both wetlands and adjacent watercourses, State review of applications to construct near shorelines often leads to a requirement for a sediment and erosion control plan for the proposed construction. Such a requirement would probably be applied to spoil disposal.

4.19 A recent informal document (ref. 49) published by the DEP reviews in considerable detail the problems involved in preparing a workable policy for dredging and spoil disposal in Long Island Sound. While only a discussion document, the paper recognizes the overriding interest of Connecticut in the policy ultimately developed, and indicates the State's determination to participate with the Corps of Engineers and EPA in the policy formulation process.

4.20 Three official State planning documents were reviewed to ascertain whether or not there would be any conflicts between the proposed action and State land use policies and plans. These are: the Connecticut Master Transportation Plan (ref. 54), the Citizens' Summary of the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (ref. 50), and A (Proposed) Plan of Conservation and Development for Connecticut

(ref. 53). One policy statement was found in the latter which concerns the proposed action.

> "4c. Ensure that environmental implications are given full consideration in decisions relating to the filling of, construction over, or adjacent to, the Long Island Sound."

Such considerations are addressed in full in this supplement. No conflicts of the proposed action with any of the aforementioned planning documents were detected.

4.21 Connecticut has no Coastal Zone Management Plan in effect at this time. However, the Connecticut Department of Environmetnal Protection (DEP) has received a grant to develop a CZM Plan over the 3 year period which commenced on June 30, 1974. Completion of a preliminary plan document is expected in early 1976.

4.22 The Program Design for the CZM Plan includes: study of alternative coastal zone boundaries; development of strategies for water and land use and priorities of permitted uses; studies to determine geographic areas of particular concern with special attention to estuarine areas in the initial development stages; administration, review and monitoring of activities and significant coastal area changes; evaluation of past responsibilities and authorities involved in CZM efforts; evaluation of alternative means for exerting effective control over land and water uses; and the conduct of a Regional Pilot Study in the Southeastern area of the State, including the shoreline and the Thames River areas.

For planning purposes, Connecticut has defined its coastal zone as the Connecticut portion of the New England River Basin Commission's Long Island Sound Regional Study area.

4.23 Connecticut has not established any Marine Sanctuaries under the Marine Protection and Sanctuaries Act.

5. THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT.

5.01 IMPACT OF NAVY DREDGING. The expected impacts of channel dredging operations are discussed in detail in paragraphs 3.02 to 3.11 of the FEIS (ref. 249). Dredging operations will be accomplished by mechanical type dredging methods using 10 to 18 cubic yard clamshell buckets in order to minimize the environmental impact. Subsequent to the bucket dredging, a steel smoothing drag may be employed to remove any remaining high spots in the dredged area. The local influences of 1st increment dredging have been carefully monitored. The results are presented in Appendix B and Volume 3

5.02 Suspended Matter: Bottom disturbance can lead to increases in suspended matter in the water column. In the third Quarterly Monitoring report (ref. 230), Bohlen reported significant increases in suspended particulates near the 1st increment dredging site. However, the suspended matter within the plume contained proportionally less fine (1 to 2 micron) particles than ambient river water, indicating a selective removal of fines within the plume. Suspended matter content of the water increased from a background level of about 5 mg/1 to as much as 150 mg/1. This disturbance was most pronounced at the dredge; it was undetectable beyond 150 meters downstream. These findings confirm the rapid settling rates predicted for these sediments in paragraph 3.04 of the FEIS. It was conservatively estimated then that the plume might extend as much as 700 meters from the dredge site.

5.03 Even within the plume area, the effects are not expected to be extreme. Suspended matter may reduce photosynthetic activity by decreasing light levels and by removal of phytoplankton through flocculation. This would result in reduced contents of chlorophyll a. 1st increment monitoring revealed little or no chlorophyll a reduction in the plume dredging.

5.04 Heavy Metals: Depending upon the chemical conditions of the water at the dredge site, the release of heavy metals will probably be in the range of trace amounts. Analyses conducted on waters within the 1st increment dredging plume have, in fact, shown that mercury concentrations are somewhat lower in the plume than in background river water. This is most probably attributable to the selective removal of fines in the plume; these fines may absorb mercury and remove it from suspension as they settle. Concentrations of heavy metals introduced into the water column might become incorporated into the food chain, thus contributing to the cumulative impact on the Thames River biota. One indication of such an occurrence would be pathological responses in filter-feeding bivalves. Many sessile organisms in estuarine environments are selective feeders and any large inorganic particulate matter is filtered out on either mucuous membranes then passed out as pseudofeces or accumulated on gill structures. As reported by Feng in the Fourth Quarterly Monitoring Report, (ref. 231), however, no abnormalities have been detected in the gills, palps, or pericardial cavities in any of the three bivalve species of shellfish studied in the river. Additionally, the flesh

of these bivalves has been tested for heavy metal content. The only discernible variations of most metal concentrations observed in these species was probably attributable to seasonal effects. In contrast, mercury concentrations in the water column and in shellfish were 3 to 10 times lower than concentrations detected from earlier measurements. The report suggested that the removal of polluted sediments by the dredging operation may have been responsible for the lower concentrations observed.

5.05 Oil: The concentrations of oil observed in the sediments may cause a visable sheen on the water surface during the dredging operation. The toxicity of oil is dependent upon the quantity of volatile aromatics, which usually dissipate after a few days from freshly spilled oil. The oil responsible for the sheen observed during dredging is depleted of aromatics and therefore is not expected to have a highly toxic effect on the biota. However, non-polar substances, such as pesticides, may become polarized to the oil particles. Fulk, et al. (ref. 76) have studied the release of pesticide materials to the water column during various dredging and disposal operations: they found that the role of oil and grease was much more important than that of suspended solids in describing the concentration of pesticide material remaining in suspension. These oil particles, when they settle, might coat the bodies and gills of benthics organisms and disrupt some life processes. Additionally, bulk pesticide concentrations in channel and berthing area sediments were found to be almost entirely less than 0.1 parts per million.

5.06 The Oil Spill Problem. The President's Panel on Oil Spills, no date (ref. 245), states that the most deleterious effect of oil is the coating of furred and feathered animals. Loss of insulation and ingestion of oil particles from grooming instincts ultimately leads to the death of the animals. No such effects have been observed or are anticipated from releases of oil in sediments as a result of the Navy dredging disturbances.

5.07 Benthic Community: One of the major effects of dredging is the removal of flora and fauna in the immediate area. Sessile forms and infauna are the most likely to be affected. During the period covered by the First Quarterly Monitoring Report (ref. 228) freshly killed hard clams (*Mercenaria mercenaria*) were found in the dredge spoil; death appeared to be the result of crushed shells sustained during dredging or dumping. Organisms such as blue crabs, lobsters and fin fishes, being mobile, can avoid capture: none have been found in the 1st increment dredging spoils. Impacts other than direct mortality might be expected from release of pollutants attending disturbance of bottom sediments during dredging.

5.08 The disruption of the benthic bacterial concentrations due to dredging is expected to impose an impact on the shellfish communities adjacent to and downstream from the dredging operation. Sediments containing bacteria dispersed and resuspended by the dredging operation will be redistributed and tend to concentrate in adjacent portions of the river. This impact is considered slight when compared to the

continuing input of bacteria to the river from point source municipal sewage discharges (see paragraph 3.13). This disruption of the macrobenthic community caused by the dredging operation should be of little consequence. The sparse benthic populations observed in the berthing areas are representative of polluted sediments and the removal of dredge spoils should serve to improve the water quality in the river and provide a more desirable habitat for the reestablishment of the benthic community.

5.09 A localized impact may be caused by the dredge depth of -59 ft. (MLW) at the ARDM mooring facility. Since the depth is some 20 ft. below proposed or existing depths this small area may not be flushed by river currents or tidal action at the same rates as adjacent areas. Therefore, saline conditions existing in the bottom layers may persist for longer periods, creating a microcosm of adapted organisms unique to the depression. This should neither impact significantly on inhabitants surrounding the depression or have a noticable affect on the river.

5.10 <u>Fisheries resources</u>: The ongoing dredging operation is expected to have a considerable but localized impact on the spawning activities of finfish and shellfish, particularly during the spring and summer months. The continuous disturbance of bottom sediments in the estuary can be expected to interfere with egg development as well as the survival of larval and juvenile forms and serve to decrease productivity in the river. The effect of dredging on productivity however, is a short term event. The removal of polluted sediments, in the long term, may provide a more suitable environment for spawning activities and should enhance

the development of desirable species.

5.11 Underwater Blasting. The possible requirement for blasting as part of the dredging procedure is also considered a potential for adverse and unavoidable environmental effects. However, the extent of the blasting resulting from this project is anticipated to be very limited in scope, based upon the engineering site investigation as presently completed.

5.12 A study by Brown and Smith (ref. 34) of the effects of underwater blasting was performed by the Navy. The study indicated that the detrimental effects upon marine life resulting from blasting can be considerably limited by precautionary procedures in positioning of the explosives. The actual shock wave measured at a distance of 350 yards, using an equivalent of 2908 pounds of TNT, was considerably less than that referenced as being lethal to fish. Air-bladdered fish, considered more sensitive to shock waves than fish without swim bladders, were suspended in cages 175 and 350 yards from the center of the demolition area and remained alive and healthy. The damage to the environment was heaviest in the immediate area of the explosions where a number of fish were killed. However, 2 hours after the last explosion, small schools of fish were observed in the area indicating that rehabitation is possible in a short time.

5.13 It is acknowledged that the extent of the environmental damage to be incurred by underwater blasting at any given area will be a function of several parameters. Such parameters include the type and

quantity of material to be removed, its depth and positioning from shore, the quantity of explosive required, the configuration of the river bottom in the area of the explosions, and the types and quantity of biota present. The actual environmental effect of the possible blasting required cannot be evaluated without consideration of the specific varibles involved; however, as was indicated by Brown and Smith (ref. 34), the detrimental effects can be limited by adequate precautionary measures.

5.14 Summary: From the above it can be expected that there will be some minor disturbance of bottom habitat in the Thames River. This will occur in the dredged areas, where the effects will be locally traumatic in the extreme for a short period of time. In addition, there may be some adverse impacts on benthic communities and habitat near the dredged areas attributable to migration of disturbed material not removed by the dredge. The latter impacts are expected to be both highly localized and of short duration. Over the long run, this removal of large amounts of polluted material may be expected to result in creation of improved conditions in the freshly dredged areas. This might apply particularly to the removal of heavy metals contained in the upper layers of the sediments. The release of oils trapped in the bottom sediments by dredging is not expected to have serious impacts on habitat or biota either in the long or short terms. There is some possibility that pesticides in the sediment will be released during dredging and will be redeposited in concentrated form after having become attached to oil particles. Results of sediment analyses reveal no evidence

to support that this mechanism is operating in the Thames River.

5.15 CUMMULATIVE DREDGING IMPACT. Not within the scope of the specific action being assessed, but related environmentally, are fifteen non-Navy dredging projects slated for execution during the same time frame as the Navy's work. These projects, which are expected to generate over 2.5 million cubic yards of dredged material by 1985, are summarized in table 5-1. Their locations are shown on figure 5-1.

5.16 The largest single project expected over the next ten years is the Army Corps of Engineers' (COE) Navigational Improvement Project for New London Harbor. This project, as originally described in a Corps of Engineers' Survey: Review of Reports, 1972 (ref. 213), consisted of "(a) Deepening of the 33-foot Federal navigation channel to 40 feet from Long Island Sound into New London Harbor, a distance of 15,500 feet; (b) Dredging a 40-acre turning basin to 30 feet at the upstream end of the 40-foot channel and (c) Dredging a 4.9 acre maneuvering area near the State Pier to a depth of 32 feet." This project as envisioned in 1972 would have generated 3,260,000 cubic yards of spoil material. However, due to the Navy's dredging efforts in the Thames River, it has been determined that only 1,643,000 cubic yards of spoil material need be removed now to effect successful accomplishment by the Corps of Engineers of the above described project. Based on estimates of time to obtain funding, this project can be expected by 1980.

5.17 In addition to this new COE work, maintenance dredging will be required in portions of the 25 foot and 19 foot channel sections

NON-NAVY DREDGING: THAMES RIVER, NEW LONDON TO NORWICH

SPONSOR	PROJECT NAME	COE PERMIT	AMOUNT	STATUS
Corps of Engineers	New London Nav. Improvement	-	1,634,000 cy	1980
	Maintenance Dredging	-	200,000 cy	1978
U.S. Coast Guard	Thames Shipyard	APPL #11-75-322	190,000 cy	1980
	Academy Pier	APPL #11-75-384	20,000 cy	1976
GDC, Electric Boat	AFDL-47	CT-LOND-75-23	7,500 cy	1976
	Wetberth	APPL #6-74-284	68,000 cy	1976
	Pier "F"	APPL #6-74-284	164,000 cy	1985
	Pier "G" and South Yard	-	425,000 cy	After 1985
	Graving Dock	CT-LOND-74-16	43,000 cy (bedrock)	1975-1976
Amerada Hess	Depth Increase at Dock	APPL #6-74-361	7,400 cy	1976
Whaling City	-	-	25,000 cy	Next 10 years
Pfizer	-	-	100,000 cy	As soon as possible
Dow Chemical	-	-	100,000 cy	As soon as possible
Lehigh Oil	-	-	2,500 cy	Next 10 years
Thames Shipyard James Street	-	-	2,000 cy	As soon as possible

TABLE 5-1

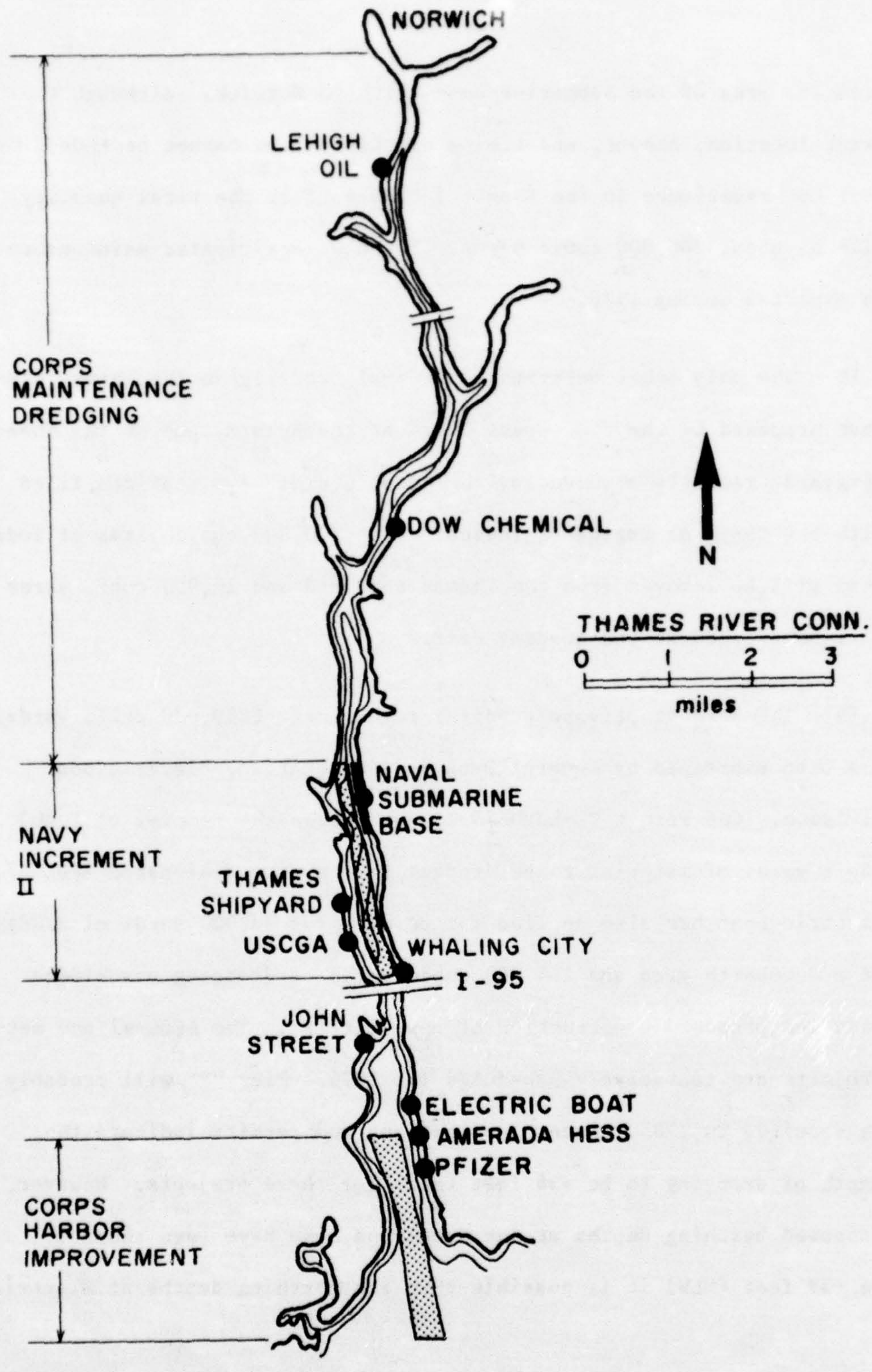


FIGURE 5-1 **ANTICIPATED DREDGING SITES THAMES RIVER 1975-1985**

from the area of the Submarine Base north to Norwich. Although the exact location, amount, and timing of this action cannot be made, past COE experience in the Thames indicates that the total quantity will be about 200,000 cubic yards. The next anticipated maintenance is expected during 1978.

5.18 The only other anticipated federal dredging in the Thames River is that proposed by the U.S. Coast Guard at the Academy and at the Thames Shipyard, recently acquired by the Coast Guard. Applications filed with the Corps of Engineers indicate that 190,000 cubic yards of sediment will be removed from the Thames Shipyard and 20,000 cubic yards will be dredged at the Academy Pier.

5.19 The largest private dredging requirement (239,000 cubic yards) has been expressed by General Dynamics Corporation, Electric Boat Division. COE Permit CT-LOND-75-23 authorizes the removal of 7,400 cubic yards of material to be dredged from a site designated AFDL-47. Electric Boat has also applied for permits for 68,000 yards of dredging of a wet-berth area and 164,000 cubic yards of dredging associated with the proposed construction of new Pier "F". The AFDL-47 and Wet-berth projects are tentatively scheduled for 1976. Pier "F" will probably be required in 1985. Recent applications and permits indicate the depth of dredging to be -36 feet (MLW) for these projects. However, since proposed berthing depths at the Submarine Base have been shown to be -39 feet (MLW) it is possible that the berthing depths at Electric

Boat will be increased to -39 feet (MLW). This increase may be necessary to accommodate the new SSN 688 class submarines being constructed at Electric Boat and ported at the Submarine Base. If and when these increases in berthing depths become necessary, a substantial increase in the quantity of dredge spoil from these projects must be considered.

5.20 Two additional Electric Boat projects are listed in the interest of completeness. Pier "G" and "South Yard" expansions are anticipated sometime following 1985. If accomplished, these will require removal of 425,000 cubic yards of material. Currently, Electric Boat has 43,000 cubic yards of bedrock which has been dynamited behind a coffer dam. This material may be disposed of either by dumping or by using or selling the material as clean fill.

5.21 Amerada Hess Corporation has applied for a permit to dredge a total of 7,400 cubic yards of material. This dredging is necessary to increase the depth of the port facility from -32 feet (MLW) to the existing channel depth of -36 feet (MLW).

5.22 In addition to these formal expressions of dredging intent, several private concerns along the Thames have expressed interest in dredging over the next ten years. Pfizer, Inc. would like to increase their docking depth from its current 18-20 feet to 30-35 feet by the removal of 100,000 cubic yards of sediments. This would allow Pfizer to accept raw material deliveries from larger vessels. Whaling City Dredging and Drydock, Inc. expects to construct new hauling ways and increase their docking depth by 1985, with associated dredging of

25,000 cubic yards. The Thames Shipyard operation is moving from the site recently purchased by the Coast Guard to a new site at the foot of John Street in New London. They expect about 2,000 cubic yards of dredging for their new bulkhead. Dow Chemical Company, Inc. expects to need about 100,000 cubic yards of maintenance dredging at their Allyn Point facility to return their docking and turning basin areas to their original 30 foot depth. Lehigh Petroleum, Inc. in Norwich, anticipates about 2,500 yards of maintenance dredging during the next ten years. These unprogrammed requirements total to 229,500 cubic yards of dredging and disposal of Thames River sediments.

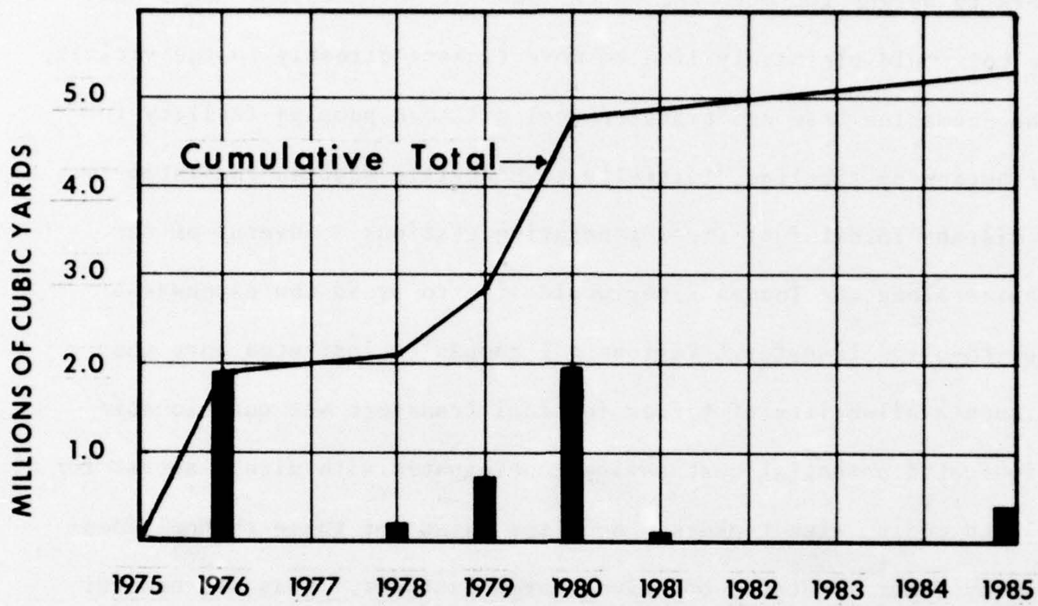
5.23 The above represent the predictable non-Navy dredging requirements discovered in a survey of the Thames River from New London to Norwich. Much of the information was gathered from contact with individuals directly associated with the proposed dredging actions (see List of Contacts). Site plans of areas to be dredged and environmental analyses are available for the Coast Guard Thames Shipyard project, the Electric Boat proposals, and the Amerada-Hess dredging. The site plans are presented as Appendix D.

5.24 Other possible sources of dredge spoil in the Thames River cannot be quantified, but need be mentioned as an adjunct to projects which can be expected with some certainty over the next ten years. Conversations with the New London Harbor Master and representatives of several private concerns along the river have indicated long range desires for increasing channel depth to 40 feet up to the vicinity of the Submarine Base, to 30 feet from the Base to the vicinity of Allyn Point, and to

25 feet from Allyn Point to Norwich. These are based on a number of considerations. Primary among these is the economic penalty associated with transferring petroleum products and bulk chemicals from ocean-going tankers to barges for movement up the Thames. Connecticut Light and Power Co. would ultimately like to move tankers directly to the vicinity of the Submarine Base and transfer fuel oil to a pumping facility for distribution by pipeline, initially to Montville Station and later to more distant fossil fuel-fired generating stations. Several of the companies along the Thames River would like to avoid the expenses of tanker-to-barge transfer. Various oil companies indicated that the continued availability of barges for fuel transport was questionable and indicated potential cost savings anticipated with direct access for small and medium size tankers. No plans exist for these channel deepenings by federal, State, or private organizations. This is, however, a slight possibility within the next ten years and may amount to a certainty in the longer term. Thus, the estimates for non-Navy dredging should be considered as minimums in dealing with the environmental implications of Thames River dredging.

5.25 Total expected Navy and non-Navy dredging of Thames River from its mouth to Norwich will amount to about 5.3 million cubic yards between 1975 and 1985. Figure 5-2 provides a tabular summary of the expected dredging and a graphic presentation of the timing of the projects. This figure demonstrates that by far the greatest proportion of this work (4.7 million cubic yards) will occur by 1980. These amounts and rates will serve as the basis for considering combined influence of dredging, both in the river

ANNUAL AND CUMULATIVE DREDGING ACTIVITY THAMES RIVER, NEW LONDON TO NORWICH



YEAR	SPONSOR	AMOUNT (cubic yards)
1976	Navy	1,845,000
	Electric Boat	75,000
	Almarada-Hess	7,400
		1,927,400
1978	Corps	200,000
1979	Navy	735,000
1980	Navy	80,000
	U.S.C.G.	210,000
	Corps	1,634,000
		1,924,000
1981	Navy	110,000
1985	Electric Boat	164,000
	Others	229,500
		393,500

FIG. 5—2

and at the disposal site, and for assessing the adequacy, desirability, and possible environmental effects of alternative methods of spoil disposal.

5.26 The data presented above allow an estimate to be made of the qualitative influences of non-Navy dredging in the Thames River. During 1976, concurrent with Navy 2nd increment dredging, (1,845,000 cubic yards) active dredging is expected at Electric Boat (75,500 cubic yards), and at Amerada Hess (7,400 cubic yards). The peak year for Thames dredging over the next decade will be 1976.

5.27 These dredging activities differ in character and magnitude, precluding any precise quantification of impacts. Generically, however, each of the projects may be expected to produce impacts similar to those anticipated from the Navy dredging. Any differences will result from spoil contaminant concentrations, which are somewhat higher in Coast Guard and Hess sediments than in sediments to be dredged by the Navy. The chemical and elutriate analyses discussed in Section 3 show these non-Navy spoils to be polluted under both past and present EPA Standards (refs. 239 and 240 respectively). The nature and kinds of analyses conducted in support of these projects preclude an in-depth evaluation or comparison of project spoils.

5.28 The most significant impact from non-Navy projects may come during 1980 from spoils generated from the USCG project in the area of the Thames Shipyard.

The high concentrations of heavy metals observed in Shipyard sediments were expected, considering the nature of ship maintenance and overhaul. The remaining non-Navy project sediments from Electric Boat and Amerada Hess Corporation are less polluted but will, however, contribute to the total impact in the River.

5.29 This impact may best be characterized by noting that there will be as many as four active dredging sites in operation simultaneously. Thus, four plumes could exist in the river at any one time. If, as is the case with Navy work reported by Bohlen (ref. 229), "good housekeeping" is practiced by other dredgers, their plumes may be restricted in extent (about 150 meters in length), thus localizing the impacts to water quality.

5.30 Impact on benthic fauna will be less pronounced from non-Navy dredging than from the Navy projects. All of the 1976 non-Navy projects will occur in active berthing areas, which characteristically support impoverished benthic communities compared to channel areas. Additionally, all non-Navy projects will encompass small areas, again minimizing direct mortality to benthics, both within and near the disturbed areas. Thus, save for an increase in the number of plume sites, impacts from combined Navy and non-Navy dredging during 1976 are expected to be similar to the impacts observed during monitoring of 1975 Navy activities.

5.31 No Thames River dredging is scheduled to commence in 1977. There may, however, be some activity early in 1977 because of administratively delayed starts of 1976 Navy and non-Navy work. In 1978 the Navy expects

to complete dredging in berthing areas at the Submarine Base, removing 815,000 cubic yards of material. 1978 is also the most likely year for Corps maintenance dredging in the upper portion of the Thames River. They will remove about 200,000 cubic yards of sediments from bar and shoal areas in the channel between the NAVSUBASE and Norwich. Navy berthing area sediments are somewhat more polluted than channel sediments. Although the channel sediments to be removed by the Corps have not been tested, it is expected that their quality may be similar to Navy's 2nd increment channel sediments. Thus, 1978 dredging will be qualitatively similar to 1976 dredging, with active projects removing both channel sediments and more polluted berthing area sediments. The ratio of berthing area sediments to channel sediments will be larger in 1978. Total quantities, however, will be smaller (one million cubic yards vs. two million cubic yards) and the number of active sites will be reduced from a possible four (in 1976) to two in 1978.

5.32 A small amount of Navy berthing area dredging (110,000 cubic yards) is expected during 1979. As discussed above, berthing area dredging causes less damage to benthic communities than channel dredging, but may entail somewhat greater deterioration of water quality in the immediate vicinity of the dredging operation.

5.33 The last major dredging activity anticipated over the next decade will be the Corps Navigation Improvement of New London Harbor in 1980, which is expected to remove 1,634,000 cubic yards of sediment from the lower Thames River. This dredging will occur in the Navy's 1st increment

area (see fig. 1-2). This area was dredged from a a depth of 32-33 feet (MLW) to 36-37 feet (MLW) by the Navy; the Corps plans a further increase in channel depth to 40 feet (MLW). As discussed in Paragraph 2.06d of the FEIS, the sediments to be removed are expected to be cleaner than channel sediments dredged by the Navy in 1st increment and 2nd increment. Sampling carried out in support of Navy actions allows a general characterization of these sediments. Samples BH-1 and BH-6 (Figures 12b and 12c, FEIS, pages 42 and 43) were taken at depths of 9 to 12 feet and 7 to 10 feet below the surface of the channel bottom, which was then at a depth of -32 feet (MLW). Thus, these samples are representative of material to be found at about -40 feet below (MLW). Concentrations of volatile solids, COD, nitrogen, and oil and grease in these samples were similar to those in Navy channel sediments. Heavy metals, however, were much less abundant in these deeper sediments. Mercury levels, which averaged 0.0000087 percent dry weight in upper sediment strata, were only 0.000004 and 0.000002 in the deeper samples. Zinc was found at a concentration of 0.0024 and 0.0035 percent dry weight in the deeper samples, as compared to an average of 0.0048 percent in upper strata sediments.

5.34 There may be some accumulation of possible polluted sediments in the lower Thames between now and 1980. Nonetheless, the bulk of the material to be removed by the Corps will probably be cleaner than sediments removed by earlier dredging projects. This dredging will have physical impacts similar to Navy 1st increment dredging observed by the monitoring studies and will involve about the same amount of spoil.

The Corps dredging may have positive impact if the dredged sediments are used to "cap" the spoils disposed of by Navy and non-Navy dredging projects prior to 1980.

5.35 Between 1975 and 1985, several additional small projects may be carried out. The impacts of these projects, totaling 229,500 cubic yards of material, cannot be assessed because of their uncertain time frame. Electric Boat may dredge 164,000 cubic yards of material in 1985, but this requirement could change or even be eliminated over the next few years. Should it be carried out, the amount of material to be removed and the restricted area involved should limit the severity of any potential impact.

5.36 <u>Summary</u>: A considerable amount of dredging activity in the Thames River, both Navy and non-Navy will take place in the next ten years. 1976 will be the most active year for dredging, with nearly half of the expected 5.3 million cubic yards being removed. Experience gained to date in monitoring of 1975 Navy 1st increment dredging indicates that the short term impacts of these projects will be limited to direct mortality to non-motile benthic organisms in the areas to be dredged and the generation of short-duration, limited-extent turbidity plumes at the sites of active dredging. The long-term impact of the dredging activity may be favorable in that the level of biologically available heavy metals in the Thames may be reduced.

5.37 Later dredging will have similar effects, both negative and positive. 1980 Corps of Engineers dredging will involve cleaner

sediments and may represent an opportunity to add to long-term benefits by capping earlier sediments. Such a future is, however, speculative, so that this benefit may be considered but not assigned with any certainty.

5.38 On balance, the expected dredging activity, with its attendant removal of polluted sediments may, when combined with ongoing clean-up of pollution sources in the Thames River, lead to more favorable biological conditions in the Thames by 1985 than are found there now. The penalties for this improvement will be the temporary destruction of benthic habitat and populations in actively dredged areas and the possible adverse effects of spoil disposal, discussed in Section 4 of this Supplement.

5.39 DREDGE MATERIAL DISPOSAL. The impacts of spoil disposal operations as related to the 1st and 2nd increments of channel dredging are addressed in paragraphs 3.29-3.26, FEIS (ref. 249). The proposed Navy projects are expected to generate 1,478,000 cubic yards of spoil materials. The increased concentrations of pollutants contained in these spoils are considered here as they may or may not impact on a proposed disposal site, the New London Dumping Ground.

5.40 Generic Impacts. The primary concerns of dumping dredge spoils in open-water areas are the effects on the fishing industry, the destruction of benthic flora and fauna, and impacts to water quality. Effects to be considered would be burial by sediments, increases of turbidity, and the release of toxic materials. Intensive monitoring in areas of the Rhode Island Sound, New London, and New Haven sites have provided

much information on these effects of spoil disposal.

5.41 The finfish community and other motile species such as crabs and lobsters are able to avoid burial by spoils. Sissenwine and Saila (ref. 190) observed that the dumping of dredge spoils had no effect upon the floating trap fishing industry of Rhode Island Sound. Spoil disposal has not diminished the trawling for finfish at the Rhode Island Sound Site.

5.42 Turbidity plumes are observed after a barge deposits a cargo of dredge spoils. The plumes are short-lived, and adverse affects are concentrated within a short time and a limited area. Decreases of plankton productivity due to loss of light penetration have not been observed. Adverse effects due to turbidity plumes are not likely to occur.

5.43 Burial under more than 20 centimeters of sediment usually results in the mortality of attached forms and infauna. MACFC (ref. 230) obtained few organisms from grab samples after disposal of dredge material on the New London site. Pratt et al. (ref. 177) found ocean quahaugs, Arctica islandica, were able to form blowholes when buried with a few centimeters of sediment. However, when buried under more than 17 centimeters of sediment, the ocean quahaugs perished.

5.44 Although burial by dredge spoil results in destruction of fauna, recolonization of dredge spoils has been observed. MACFC (ref. 232) observed that, after the disposal of 1.5 million cubic yards of dredge spoil in the summer of 1974 at the New London dump site, recolonization

was well underway during the fall of 1975. McCall (ref. 129) found some organisms to be opportunists, such as *Ampelisca*. During the recolonization of the spoils, *Ampelisca vadorum* contributed to the abundance of organisms throughout the spoil area. Pratt *et al*. (ref. 176) observed recolonization of dredge spoils at the Rhode Island Sound Site. *Ampelisca agassizi* was apparent in areas surrounding the reef, and *Nepthys incisa*, *Tharyx acutus* and *Ampharete arctica* were found throughout the Rhode Island Sound Site.

5.45 MACFC (ref. 231) found no gross pathology to shellfish in the Thames River during dredging. However, due to the quality of water in the New London Harbor area, harvesting of shellfish is prohibited. Bireley and Buck (ref. 14) reported that use of dredge spoil disposal site for New Haven harbor did not produce long-term effects on bacterial populations of water and sediment. The study measured total and fecal coliform bacteria.

5.46 Mortality of commercially important shellfish and other fauna could result from accumulation of toxic materials from the dredge spoils. Ribeiro (personal communication) has found that the ocean quahaugs from the Rhode Island Sound Site area cannot be harvested because the flesh may be tainted. Providence River sediments deposited at the Rhode Island Sound Site were high in toxic materials.

5.47 Analysis of sediment from New London Harbor for heavy metals has shown these sediments to contain considerably lower concentrations of such metals as mercury, lead, zinc, and nickel, than other Connecticut harbors including New Haven and Norwalk (ref. 213). Additionally, comparison of metal analyses from New London spoils and dump spoils

from the Rhode Island Sound Site indicate New London spoils to contain lower concentrations than the latter source. As a result of the MACFC studies (ref. 231), the overall conclusion of the chemical oceanographic monitoring of the Navy disposal at New London is, "no major changes attributable to dumping has yet been detected in the water or sediments,"

5.48 While the findings of chemical sediment analysis of the Rhode Island Sound Site spoils and their impact on surrounding sediments are preliminary, a certain degree of shellfish contamination has been detected (Pesch, personal communication). With the exception of iron concentrations, consistent gradients from the center of the spoil site to peripheral areas have not been found at the New London Site. Such is not the case at the Rhode Island Sound Site where metals are found in the spoil but drastically decreased levels are found at peripheral areas (Pesch, personal communication). Therefore, an argument could be presented that New London dredge spoil might be used to 'cap' the sediments at the Rhode Island Sound Site. Although the extent of long-term environmental effects of dumping contaminated dredge spoils in the marine environment is not known, recent research has shown that the short-term effects as "...concerns release of toxic materials into solution phase during dredging operations and disposal are mostly unfounded."

5.49 Cumulative Impacts to the New London Dumping Ground: The Navy's monitoring studies (ref. 231) have not detected any adverse environmental affects resulting from the 1st increment of channel dredging and spoil disposal at the New London Dumping Ground. The following discussion addresses the expected impact of additional quantities of spoil and pollutants as pertains to proposed projects and the continuous spoiling of this site.

5.50 Bathymetric Impacts. To date, 1.5 million cubic yards of spoil materials have been disposed of at the New London Dumping Ground during the 1st increment of channel dredging. On August 13, 1975, a cooperative study between the USCGA and the Navy was undertaken in order to determine the quantity of spoil disposed of at the site as well as the physical capacity of the depression. The bottom profiles as determined by the survey (Appendix K) accounted for 95% of the material deposited at the site. This should not be construed to imply that 5% of the spoil pile has eroded. Rather, as indicated in Appendix K the 5% figure is indicative of a lack of definition in the survey system more representative of known technical error than erosion. Having considered all known sources of error within the survey system, and to avoid an over-interpretation of the data, the authors speculated that minimal erosion (if it had occured at all) may have occured due to existing current and tidal regime. However, since the extent of erosional error has not been measured and can not be related to observed data, the <u>extent</u> of erosion, <u>within the 5% margin of error</u> for this survey remains speculatory and should not be inferred.

The survey also showed that the depression of the site will be sufficient to accept the 5.3 million cubic yards of material generated from pending Navy and non-Navy projects without affecting navigational approaches to New London Harbor. If the 5.3 million cubic yards is deposited uniformly over the dumping ground, the average decrease in depth will be on the order of 4 feet. There may be local mounds with depths of up to 20 feet, as was the case in 1st increment disposal, but localized settling and spreading of the spoil pile will tend to reduce these surficial irregularities with time.

5.51 Dispersed spoils that may be transported by currents and tides from the disposal site to other locations in the Sound are not expected to impose a threat to distant benthic communities. Pearce (ref. 166) reported that organics transported from dumping grounds receiving sewage sludge (which is much higher in organic and toxic materials than the spoil being considered here) did not appear to have a fertilizing affect on benthic fauna. The on-going monitoring studies have not been able to determine the extent of sediment transport as it may affect areas adjacent to the disposal site, but the volumetric measurements made by the NUSC - USCGA (Appendix K) indicate that the bulk of the material is not leaving the site.

5.52 The extent of the impact of suspended matter at the disposal site depends largely on the length of time the material is in suspension after having been discharged from the barge. Hollman et al. in the 4th quarterly report (ref. 231) determined that turbidity caused by dumping is a short term event, and a return of the turbidity to near ambient conditions is observed shortly after dumping. Dissolved oxygen concentrations were observed to return to background within ten minutes following a dump. Gordon (ref. 95) in a study of the New Haven Dumping Ground in Long Island Sound concluded that "99% of non-cohesive spoil of high silt content discharged from a scow in the presence of a tidal stream is transported to the bottom as a high speed, turbulent jet." Gordon's study indicated that the spoil does not fall as individual particles but is carried very rapidly to the bottom as a 'density current.' This implies that the environmental impacts associated with the discharge of dredge materials may be minimized by the limited contact time available

to pollutants traversing the water column. Given the stability of the spoil pile at New London, this should serve to limit the extent and severity of remote impacts from the accumulated activity. Single dump events can be expected to produce small impacts as their turbidity plumes leave the site and disperse, but these impacts, as shown by the MACFC monitoring efforts, are short-lived and not severe.

5.53 Chemical Impacts. The spoils to be removed from berthing areas are generally more polluted than channel spoils. For example, on a volume basis, the 500,000 cubic yards of dredged material generated from Navy pier-side projects during 1976 represent approximately 38% of the 1.3 million cubic yards of spoil to be removed during the 2nd increment of channel dredging. A comparison based on the dry weights of various pollutants, as determined from analyses of bottom sediments, indicates that the impact of the smaller quantity of spoil may be greater. Generally, sediments can be expected to contain higher concentrations of pollutants at pier facilities that are focal points for the servicing and maintenance of shipping operations. This is true for both Navy and non-Navy spoils, as discussed in Paragraphs 3.22 - 3.28.

5.54 Heavy metals released to the water column is considered a relatively short term event. For example, Wershaw (ref. 262) concluded that "mercury concentrations in fresh surface waters, dissolved or suspended, are rapidly reduced due to sorption and by complexing reactions with clays, plankton, colloidal proteins, humic materials and other organic and inorganic colloids." Although the chemical properties of heavy metals in seawater are not necessarily the same, it is expected that similar chemical phenomena will aid in reducing concentrations

of heavy metals within the water column with time, again reducing remote and cumulative impacts. Future monitoring studies at the New London Site will include cage experiments whereby shellfish are confined to specific areas of the disposal site and periodically monitored for the uptake of heavy metals. It is hoped that these experiments will yield more meaningful results as concerns the impact caused by the disposal of heavy metals.

5.55 The disposal of oily sediments is expected to cause a visible sheen on the surface waters in the immediate vicinity of the scow, but due to current flows and tidal action the oil should disperse rather rapidly. The oily sediments are also expected to cause a localized impact on the benthic communities that are beginning to inhabit the spoil pile. Unless oily sediments are covered with less polluted material, benthic recovery may take considerably longer. However, the feasibility of scheduling and deploying dredging equipment for large dredging operations so as to coincide with polluted conditions at specific locations is generally limited. It should be noted that regulations pertaining to oil disposal (ref. 72) give no consideration to oil disposed of in dredge spoil sediments. Additionally, University of Rhode Island monitoring at the Rhode Island Sound Site found recolonization of similar oily sediments, with full equilibrium expected in 11 years (ref. 176).

5.56 Due to the relatively low concentrations observed in the sediments for Phenols, DDT, and PCBs, the environmental impact on the disposal site and surrounding areas is expected to be undetectable. Although the concentrations of PCB's are observed to be somewhat higher in pierside

sediments than in the channel they are not as high as the PCB concentrations observed where chronic sources exist. Since these compounds are not readily bio-degradable there are long-term environmental implications as concerns the incorporation of these compounds into the food chain. Until the mobility vectors and/or rates at which these compounds are incorporated into the food chain are firmly established, the overall significance of biological impacts attributable to the specific concentrations observed in Navy sediments, or any other sediments, will remain unknown. This is attested, to by the fact that no criteria (specific concentrations) have yet been established for PCB's in dredge spoils.

5.57 Biological Impacts. Organic constituents contained in the sediments and suspended particulates are expected to contribute to localized plankton activity. Although the affects of nutrient enrichment on plankton populations have not yet been realized, there is evidence that the spoil material is providing suitable substrate for the reestablishment of a desirable benthic population. The 3rd quarterly monitoring report (ref. 230) stated that five studies "revealed considerable activity by lobsters, rock crabs and finfish in the spoils as well as some infaunal colonization." In addition, on August 13, 1975, divers reported large numbers of flounder on the spoil pile. This beginning of recolonization points to the ultimate cumulative influence of spoiling at New London. Each renewed episode of material deposition will result in a temporary impoverishment of the benthic communit. Following each event, recovery will begin almost immediately. Full recovery, however, must await the final cessation of dumping at New London. When that occurs, recovery may then proceed to an equilibrium composed of a silty substrate community on the site.

5.58 Intensive monitoring at the disposal buoy yielded reliable in-information on recolonization of spoils. Prior to disposal, diversity of species and individual abundances were high at the disposal buoy. *Ampelisca vadorum* was the predominant species. After dumping, which occurred in summer 1974, diversity and abundances dropped significantly. The spoil-covered area did not yield more than a few organisms, including *Nucula proxima* or *Pitar morrhuana*, in some samples. These two species could have been introduced to the disposal site via dredge spoils since they are found in river habitats as well. MACFC, in the Second Quarterly Report (ref. 229), cites the decrease of diversity and stability of the population as caused by the abrupt decrease of *Ampelisca vadorum*. Pratt *et al.* (ref. 177) studying *Ampelisca agassizi* found that perhaps sedimentation of a few centimeters may cause the amphipods to abandon their tubes. Introduction of a small bivalve, *Gemma gemma*, had occurred by mid-winter, 1975. Influx of some mobile species such as *Nepthys incisa* and *Pagurus longicarpus* were observed by summer, 1975. Diversity indices were higher and *Ampelisca vadorum* was becoming more abundant throughout the dump site. MACFC, in the Fifth Quarterly Report (ref. 232), stated that recolonization was well underway. More *Ameplisca vadorum* and some *Leptocheirus* were obtained in grab samples. These organisms are perhaps the first stage in the "climax" assemblage for New London.

5.59 Graikoski *et al.*, in the 3rd quarterly monitoring report (ref. 230) stated that "fecal coliform and bacterial densitites in near-shore sediments were significantly higher than those observed near the center of the disposal site." Graikoski implied that the river outflow was contributing a significant contamination pressure. These results

suggest that bacteria contained in the river spoils and discharged at the disposal site may be causing less of an impact than river pollutants discharged by the Thames River, now and probably in the future.

5.60 Heavy coliform concentrations originating from domestic sewage such as those observed in polluted spoils are known to contain human pathogens. The survival of these organisms for extended periods of time in salt water is doubtful. Vind et al.,(ref. 258) report data which show the germicidal effects of sunlight and sea salts on Escherichia coli at various ocean depths. Survival rates decreased in salt water with length of exposure time reducing the chances for contaminating other marine life. Although these organisms are known to survive in the interstitial waters of sediments as well as shellfish communities it is assumed that their survival in the external environment is relatively short term.

5.61 Fisheries. Preliminary indications from the Navy monitoring studies would suggest that the effects of dredging and spoiling at New London may be beneficial to the enhancement of local fisheries. The cleansing of the lower portions of the river by the removal of polluted sediments may improve habitat and serve to promote spawning of desirable species of finfish. Shellfishing may also improve in quantity as well as quality.

5.62 Divers investigating the disposal site continue to make favorable reports on the reestablishment of the benthic community and the increasing numbers of desirable species of finfish and shellfish. As

reported earlier, large numbers of flounder have been recently observed at the disposal site as were numerous lobster pots. A note of caution, should be made as concerns fishing disposal sites. Since the extent or sources of contamination in organisms frequenting disposal sites have not yet been determined, the consequences of using these organisms as a food source is not known and should be discouraged.

5.63 Cumulative Impact. Detailed information on non-Navy dredging and dumping projects, existing and proposed, in the New London area is presented in paragraphs 5.13 through 5.24 above and in paragraphs 6.175 through 6.180 in the next section. It is intended in this sub-section to assess the anticipated cumulative impact of these non-Navy projects when combined with the Navy's Thames River project on the ocean's environment.

5.64 Physical. As indicated in Table 6-7, some 14 million cubic yards of material dredged in the New London area has been deposited aperiodically over the last 25 years in the Long Island Sound, the Rhode Island Sound and in open waters. Projects requiring disposal of an additional 14.4 million cubic yards of dredged material over the next ten years have been identified (see fig. 5-2 and tables 6-8 and 6-9). Although permit actions leading to specific designation of disposal sites for a majority of these projects have not been accomplished, it is probable that the New London Dumping Ground would be designated for approximately 5.4 million cubic yards, the Rhode Island Sound Site for approximately 7.3 million cubic yards, and

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Cornfield Shoals for 40,000 cubic yards. The remainder, derived from diverse, small projects, will probably be allowed either land or local open water disposal in the general proximity of the dredge site.

5.65 Disposal of the 14 million cubic yards of dredged material at the locations indicated above will decrease the capacities of the New London Dumping Ground and the Rhode Island Site by 13% and 21% respectively. Capacity at the historical Cornfield Shoals site will not be affected to any great extent. Considering that the first two sites are containment sites, it is anticipated that there will be little movement of the spoils out of the dumpsites. Because of its shallow depth and proximate location to New London Harbor, controlled disposal at the New London Dumping Ground is necessary to ensure that mounding does not interfere with navigation.

5.66 Biological. Continuous disposal at these disposal sites over the next ten years will have an inhibitory effect on benthic recolonization and will prevent the benthic community from completely reaching an equilibrium. That these sites have been used historically as disposal areas should minimize this impact. In fact, the Environmental Protection Agency, in its guidelines on the discharge of dredged or fill material in navigable waters (40 Fed. Reg. 41298), alludes to this fact by stating "Use of existing disposal sites is generally desirable."

5.67 At the present time, research results on the long-term environmental effects of spoil disposal as it may or may not impact on the fisheries

resources is inconclusive. It is not anticipated that these long-term environmental impacts will be determined in the near future. Therefore, without continued in situ environmental monitoring programs, any assessment of the impacts of dredge spoil disposal will remain speculative and be only based on state-of-the-art knowledge.

5.68 Chemical. The interaction between the chemical constitutents of spoils and the water phase of the environment has not yet been adequately determined (ref. 120, 274). Therefore, the long-term cumulative enviromental effects either direct or synergistic, or combined spoil disposal (chemical constituents) on specific or regional sites is not known.

5.69 The Endangered Species Act OF 1973 (P.L. 92-205), provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The species lists compiled in the FEIS concerning the proposed project were reviewed to detect the presence of endangered species. No such species were found in the Thames River which would be affected by project actions. The shortnosed sturgeon (*Acipenser brevirostrum*) has been found in commercial finfish catches in Long Island Sound, but there have been no records of catches of this species in the Thames River Estuary.

5.70 "East Hole" contingency site: In a continuing effort to insure project goals remained on schedule, evaluation of the impact of project spoils on a contingency site was undertaken. This was considered a step forward toward providing the Navy with a suitable disposal site

in the event that the early detection of an adverse environmental effect prohibited further spoiling at the New London Dumping Ground. To this end, an elutriate comparison was made to determine the impact of project spoils on "East Hole" waters and New London Dumping Ground waters. A statistical analyses for variance was conducted on several chemical parameters detected in elutriates of waters collected from each of the sites. The results of the analyses indicated that the chemical impacts of Navy project spoils in waters at either of these sites may be similar (table 3-17).

5.71 Economic and Social Impacts: The impacts of dredging the Thames River and disposal of dredge spoils in Long Island Sound should be considered as it affects the economic, social and long-term recreational interests of man. The deeper channel depths dredged by the Navy are expected to accommodate deeper draft vessels and increase the annual tonnage of shipping servicing the New London Harbor. Larger vessels may require more adequate port facilities in order to handle the additional kinds and quantities of raw materials. This should in turn stimulate the economy by the development and/or expansion of industries creating additional employment opportunities for the New London-Groton region.

5.72 The defense industry is as vital to the local economy as it is to the National Defense. Dusic (ref. 206) reported that 75% of the employment opportunities in the Thames River estuary are provided by the defense industry. The NAVSUBASE receives substantial support from its civilian

personnel and surrounding industries thus providing a continuing stimulus to the local economies of New London and Groton. The introduction of the SSN 688 class submarines is expected to add further stimulus to the local economy and insure that the NAVSUBASE remains a viable National Defense facility.

5.73 The dredging and disposal operations are expected to cause a minimal impact on the local commercial fisheries. Preliminary findings from the Navy's monitoring studies suggest that initial impacts to the biota are temporary. Evidence of biological recovery has been reported both in the river and at the disposal site. In the long term the commercial fisheries in the river are expected to benefit.

5.74 Impact on recreation: The impact of dredging on the recreational uses of Long Island Sound and adjacent waters must be evaluated in terms of water quality. The water quality, as it now exists, is being continually degraded by the encroachment of industrial and municipal pollution sources. Tons of heavy metals and organics from heavily industrialized areas are being discharged each year into Long Island Sound and adjacent estuaries, contributing to the deterioration of the water quality and sediments.

5.75 In order that shipping channels remain free of natural siltation, frequent removal of polluted sediments becomes necessary. The cumulative impact of these pollutants when deposited in the Sound will certainly have an effect on the water quality as well as the fisheries resources.

5.76 Since estuaries serve as productive nursery areas for so many of the important commercial and sport fisheries, their preservation is essential to the economy and recreational interests of Long Island Sound. In compliance with the Water Pollution Control Act of 1972 (PL 92-500), the abatement of point source discharges to adjacent estuaries in the Sound will gradually improve the water quality reducing the contamination load to the sediments. A restoration of estuarine environments would promote more productive nursery areas, improve the fisheries resources and reduce the impacts associated with dredge spoil disposal.

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 DO-NOTHING. The environmental impacts associated with any of the Navy dredging projects are avoidable provided none of the actions are implemented. As described in Appendix A, however, existent berthing and drydocking facilities are inadequate and will not meet the future requirements of the new and larger SSN 688 class submarines scheduled to be ported at the NAVSUBASE. The construction projects described in Appendix A, as well as the dredging assessed herein, are necessary to support the new class of submarines and to insure that the NAVSUBASE remains a viable National Defense facility. As stated in Section 5 of the FEIS, acceptance of the do-nothing alternative would limit the tactical deployment of the ship and would have an incalculable serious effect on the National Defense. In addition to the impairment of the Nation's defense posture, the do-nothing *alternative would limit further* development of the NAVSUBASE. The resulting adverse impacts imposed on the local economies of New London and Groton would have long-term significance as concerns regional employment opportunities.

6.02 DREDGING - Alternative Techniques. Paragraph 5 of the FEIS addressed then available alternative methods of dredging. Since then, new developments in dredging have involved hydraulic equipment. Cutterhead shields or covers are now being used to reduce the turbidity plume associated with conventional hydraulic dredging. The possibility of using swivel and impeller cutterheads in hydraulic dredging is being investigated at the present time. Both the cutterheads and the cutterhead

shields will act to reduce the turbidity plume and will add to dredge productivity.

6.03 An air-lift type of dredge known as a "Pneuma" has been developed by S.I.R.S.I., Florence, Italy. Hydraulic lines remove the spoil as in conventional hydraulic dredging, but the initial lift is provided by compressed air. Use of this dredge in confined waterways looks promising (ref. 27).

6.04 Discussions were carried out with representatives of several companies (the Dravo Corporation, Pittsburgh, Pennsylvania; the Owens Bucket Company, Cleveland, Ohio; and the Weeks Dredging and Contracting Inc., Elizabeth, New Jersey) to determine if any modifications had been made in clamshell dredging techniques since the FEIS. It was the opinion of both the Dravo Corporation, and the Owens Bucket Company that no significant changes have taken place. One manufacturer has suggested the possibility of using a hydraulic slave cylinder closure attachment as the means of bucket control rather than the conventional "rope wreath" method. This was discounted for several reasons. According to the Dravo Corp, the hydraulic pressure necessary to close a bucket in the 10-18 cubic yards range could very well damage the bucket in the process. It also is a very expensive technique to implement.

6.05 Several methods of minimizing turbidity effects at the dredge site have been suggested. The use of a silt curtain constructed of polyvinyl chloride or other materials is possible in areas of low current. An analysis of functional capabilities and performance of various

silt curtains is currently under contract to the U.S. Army Corps of Engineers' Dredged Material Research Program (DMRP), Vicksburg, Mississippi. Bubble screens, formed with compressed air, are also used in areas of low current velocities. This technique is not readily applicable at the New London site, because Thames River currents are so strong and would disrupt the screen.

6.06 The use of large volume clamshells still appears to be the most sound method for dredging the Thames River. Their use allows removal of large, cohesive sediment masses, thus minimizing turbidity near the dredge site. Additionally, these cohesive masses are more stable when dumped thereby reducing impact at the disposal site.

6.07 Alternative Transport Systems. An analysis of techniques for moving dredge spoil from the dredge site to the dump site indicates that the following basic transport systems, individually, or in combination are used: pipelines, barges (scows, varying from shallow-draft to ocean-going), and overland methods such as tank cars and/or trucks. The type of dredging equipment used, the nature of the dredged sediments, the distance material is to be moved, and the routes involved mandate the transport system best suited for the situation.

6.08 Exclusive pipeline transport of dredged material is an unlikely alternative, as hydraulic dredging is not actively being considered as the primary dredging method.

6.09 A combined scow-pipeline system could be utilized were land dis-

posal sites selected which could not be reached by railcars or tank truck. This method of transport requires a remobilization of mechanically dredged sediments, which results in a dewatering problem at the disposal site and could lead to additional shore side impacts from pipeline construction.

6.10 Mechanical dredges, such as those used in 1st Increment dredging, employ scows for spoil disposal. Scows may vary from shallow draft to large capacity ocean going scows (up to 4000 cubic yards). The choice of scow is governed by the dump site location and the amount of material to be dredged. Few developments have been made in scow design subsequent to the FEIS, although some companies now possess barges with self-contained pump out capability. This would be useful for waterfront disposal sites, as it minimizes rehandling expenses. Large capacity scows with bottom dump doors are still considered to be the best choice for water disposal sites considered herein. These scows allow for dumping of a cohesive sediment mass without rehandling expenses. Part-land/part-sea methods may require overland transport of some dredged materials, either by hopper car or truck, in conjunction with other techniques discussed above. The viability of this method depends on several factors: the total amount of material to be removed; land disposal/sea disposal ratio; transport distances by land and sea; dumpsite availability and characteristics; and environmental and economic impacts.

6.11 DREDGE SPOIL DISPOSAL. Alternative dredge spoil disposal techniques may be classified as land disposal, water disposal or a combination

of the two. Determinations as to the applicability of a method to the New London area have been made by considering the physical and chemical properties of the dredged sediment, the availability of site areas large enough to accommodate the expected amounts of dredge spoil, the environmental impacts associated with various sites and methods, and the relative costs.

6.12 Spoil upgrading: Prior to disposal, spoil upgrading might be used with any technique (ref. 217). However, separation methods to upgrade the quality of the dredge spoil (such as dewatering, incineration, or pollutant oxidation) are not yet well enough developed to deal with the large volume of sediment to be dredged at the New London site. The assumption is made in the following discussions that unimproved Thames River sediments will be disposed of and assessments of suitability have been based on the measured physical and chemical properties of those sediments.

6.13 Beach nourishment: This method has been used by the Corps of Engineers in many places to dispose of relatively clean, sand size spoil. Thames River spoil can not be considered for beach nourishment because of the fine size and the polluted nature of the sediments.

6.14 Sanitary landfill cover: Using dredge spoil as a sanitary landfill capping material requires the use of sediments not containing pollutants which could leach into the water table. Additionally, the sediments should possess enough strength to support earthmoving machinery necessary for operation of the sanitary landfill. Sediments from the

Thames River do not satisfy requirements for sanitary landfill use because of their lack of strength and because of sorbed contaminants which can leach when wetted by fresh water.

6.15 Strip mine reclamation: The use of strip mines for the disposal of dredged material is currently under investigation by the Corps of Engineers' Dredged Material Research Program (DMRP). However, that there are no strip mines within a reasonable distance of New London rules this method out as a means of disposal. The contaminants mentioned above might make these sediments undesirable for this use as well.

6.16 Construction material: Construction material might be produced from dredged spoil. Fine-grained sediment recovered from harbors and bays along the northeast coast of the United States has been used to produce ceramic bricks comparable to commercially used lightweight expanded shale aggregates (ref. 181). The Corps of Engineers, New England Division, has attempted to make bricks out of Thames River sediments without success. Were the material satisfactory, it would still be difficult to produce bricks at a sufficient rate to match the anticipated dredge production of spoil.

6.17 Waterfront disposal: Waterfront disposal of dredge spoil can be resorted to in certain situations. The poor mechanical properties of sediments such as those found in the Thames River limits the usefulness of this technique. The dredge spoil could conceivably be mixed with other sound fill material to provide the strength necessary for low-load applications, such as parking lots. Alternatively, pile supported struc-

tures might rest directly atop unmixed spoil material. Several possible sites for waterfront disposal are considered in later sections.

6.18 Diked land disposal: This method is the most common alternative to deep water dumping. Careful site selection and engineering is essential to minimize environmental harm. Site engineering must consider groundwater problems, dike instability, seepage, dike erosion, surface ponding, and material distribution problems within the impoundment. When hydraulic transport is used, additional area is required for settling basins. This is normally provided on land, but, under special circumstances, settling may be accomplished in adjacent water areas. Either upland or waterfront construction of confined disposal areas results in the destruction of flora and fauna. Many land disposal areas are adjacent to natural water systems and spillage often occurs from the confinement area with deleterious results. Materials in the vicinity of a weir from a Mobile, Alabama disposal area increased turbidity in adjacent water to 25%. Harrison et al. (ref. 99) found that a disposal area in Portland, Oregon overflowed into an adjacent body of water; the resulting turbidity ultimately interfered with salmon migration. Turbidity effects from land disposal overflow are similar to those associated with active dredging.

6.19 Depending upon the nature of the spoil, certain contaminants may reach sediments outside of the disposal area either by leaching or dike rupture. In some areas, where the dredge spoil has a high salt content, the seepage was toxic to surrounding vegetation. Such areas stripped

of vegetation may lead to further erosion problems. Harrison et al. (ref. 99) reported several instances in Jacksonville, Mississippi, where seepage introduced contaminants into the ground water which ultimately affected wells in the area.

6.20 Disposal on land may lead to a number of other problems such as: mosquito breeding, objectionable odors, machinery noise, visual impact, and sometimes dust. These effects may be severe enough to adversely impact on the value of nearby property. Two particularly objectionable effects are the generation of hydrogen sulfide gas by anaerobic decomposition of highly organic spoils and mosquito colonization of dessication cracks formed as the material dries. Local experience, however, indicates that these secondary adverse effects of confined land disposal may not be severe along the Thames River. Inspections of the Hempstead Farms Disposal area (last used in 1960) revealed abundant vegetation within and outside the containment dikes. No objectionable odors or other nuisance conditions were detected.

6.21 Island building: Island building has often been suggested as an alternative to deep water dumping. The Long Island Sound Study (ref. 153) quoted earlier suggested the creation of islands as a method of spoil disposal and of creating badly needed recreational land. A study of dredging and spoil disposal in Long Island Sound prepared by the State of Connecticut (ref. 49) concluded that this option would not be feasible, even in the western part of Long Island Sound. Consultation with the U.S. Army Corps of Engineers, New England Division has also

raised severe doubts about the utility of this technique in Long Island Sound. A preliminary survey of waters near the mouth of the Thames River has disclosed few sites suitable for construction of islands. The Black Ledge area, approxmately 0.5 miles southwest of Avery Point, Connecticut has been considered as a site for such construction. Preliminary calculations suggest that a total of approximately one million cubic yards of spoil material might be accomodated at this site. This would require initial preparations including the erection of a steel pile containment structure, extending to above the waterline, approximately 1.5 miles in perimeter, and the deposition of between 60,000 and 100,000 cubic yards of rip-rap material. Rip-rap would be placed on both sides of the piles.

6.22 While no precise cost estimates have been made, it would clearly be very expensive to procure, transport, and place the large amount of stone for the rip-rap and the steel sheet-piling for silt retention. In addition, the amount of spoil that could be accommodated is less than the amount of spoil generated by this project and less than one-fifth of the projected total for the Thames River projects through 1985.

6.23 In general, island creation does not appear to be feasible alternative for disposal of the Navy dredging project spoils. As noted in the case of Black Ledge, anticipated costs would be very high and in most cases an additional navigational hazard would be created. Perhaps of greatest significance, the impact on marine life at or near the site has not been adequately studied.

6.24 Container disposal: This method is methodologically equivalent to island construction and must be rejected for the same reasons.

6.25 Marsh building: Building marshes from dredge spoil has been the subject of considerable recent research under the Corps of Engineers' Dredged Material Research Program. Figure 6-1 graphically represents the approach used to select or reject a site for marsh creation.

6.26 Marsh building with dredge spoil from the Thames River is not a viable land disposal technique for several reasons. The large amount of sediment (see figure 5-2) to be dredged rules out any possible site or site combinations in the New London area. Such a marsh complex would pose navigational problems and could devalue present shoreline properties. Should a site for marsh construction become available, however, the environmental implications of using this technique would need to be explored in great detail. Numerous impacts might be expected including topographic modifications and alterations in water circulation patterns. Behind land projections the strength of currents usually diminishes and areas of little or no circulation are formed. These "pockets" usually collect large amounts of algae which can impart septic odors and are aesthetically unappealing. These "blooms" can alter biological oxygen demand, and pH and induce skin reactions on bathers. Harrison *et al*. (ref. 99) stated that clam beds in Portland, Oregon had been destroyed by sedimentation as a result of water pattern alterations.

6.27 Subaqueous borrow pits: Borrow pits, which could be filled with

GRAPHIC REPRESENTATION OF THE GENERAL METHOD OF

MARSH SITE SELECTION

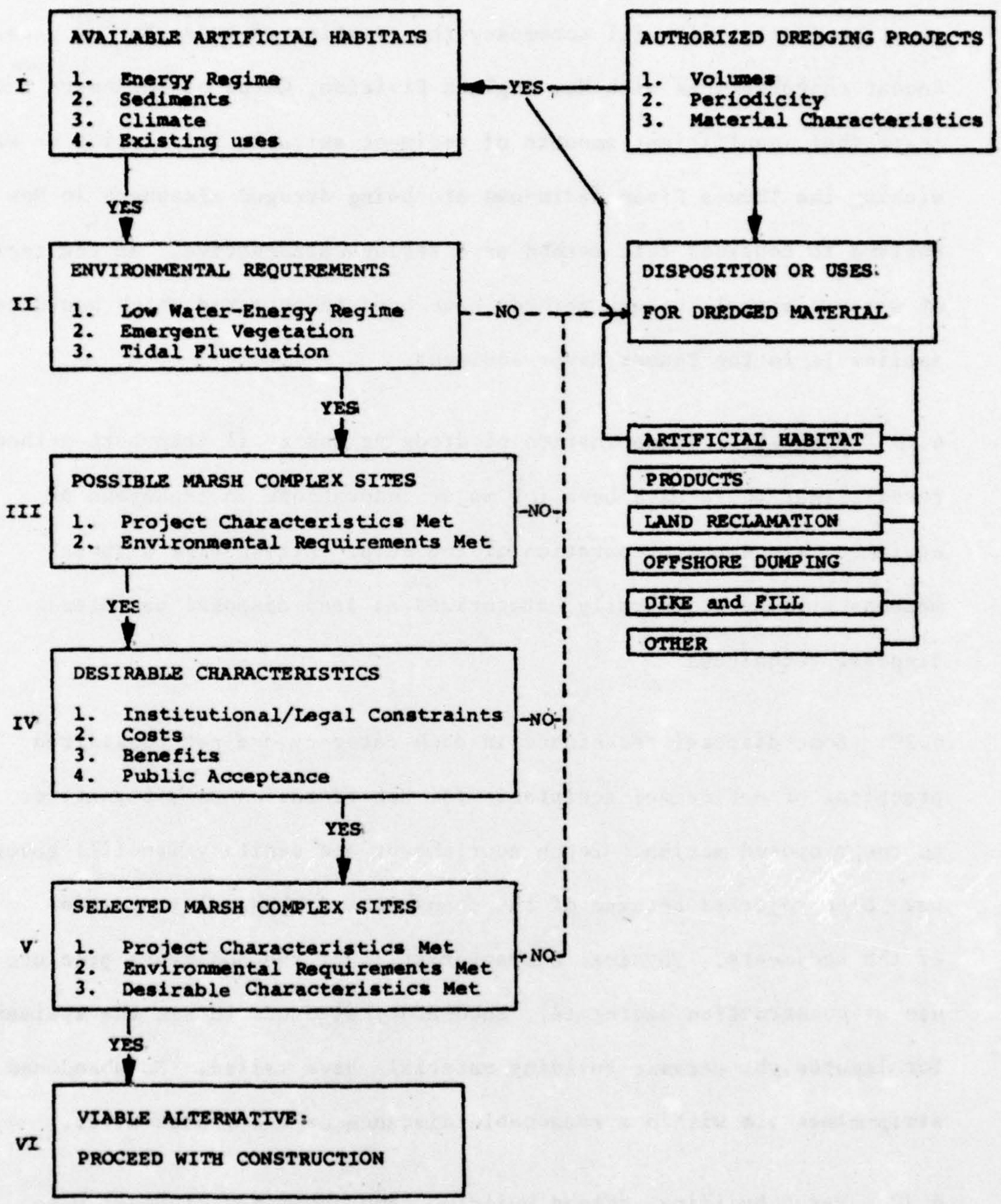


FIG. 6-1

dredge spoil and then capped by a coarser-grained, less contaminated layer, present problems of their own. Dredging and the disruption of existing marine life will accompany the creation of these borrow pits. Recent conversations with New England Division, Corps of Engineers indicate that insufficient amounts of sediment suitable for capping or sandwiching the Thames River sediments are being dredged elsewhere in New England to consider this method as a serious alternative. In the realm of water disposal, no new methods have been encountered which would be applicable to the Thames River sediment.

6.28 SUMMARY: Reexamination of dredging and spoil transport methods reveals that there have been few major innovations in technique or equipment since the preparation of the FEIS. Alternative disposal methods have been generally categorized as land disposal or water disposal techniques.

6.29 Some disposal techniques in each category are not considered practical or not deemed acceptable for consideration as alternatives to the proposed action. Beach nourishment and sanitary landfill cover have been rejected because of the chemical and physical properties of the sediments. Physical characteristics of the sediments preclude use as construction aggregate. Laboratory attempts to use the sediments for lightweight ceramic building materials have failed. No abandoned strip-mines are within a reasonable distance of the Thames River.

6.30 Marsh building, island building, and container disposal were rejected for environmental reasons and a lack of areas large enough

to accomodate a significant portion of the sediment to be dredged. For long term consideration, island building has been considered by the States of Connecticut and New York and may have some positive effects such as creation of badly needed recreational sites.

6.31 Spoil disposal at waterfront fill and upland diked area sites has been examined and appear to represent viable methods for disposition of some of the Navy dredge spoil. Potential environmental impacts of such techniques have been examined. A more detailed examination of specific sites and their capacity to accept spoil and the costs associated with their use is given in the following paragraphs.

6.32 POTENTIAL FOR LAND DISPOSAL OF DREDGE SPOIL. The following discussion of land disposal as an alternative to at-sea disposal of the spoil from the Navy project represents a major revision of the material presented in the FEIS. It is based on that document, on a study conducted by C.E. Maguire, Inc. (ref. 40), on numerous visits to and telephone contacts with private individuals and officials listed in the List of Contacts, and on field inspections.

6.33 The FEIS considered land disposal of spoil from the Navy dredging projects in the Thames River channel and at the Submarine Base. As a result of a survey of potential disposal sites in the vicinity, the FEIS identified five areas deemed worthy of consideration. In total, it was estimated that these would accommodate about 1,700,000 cubic yards of dredge spoil. Since this was considerably less than the total amount to be removed, the alternative of total land disposal was found to be infeasible. For a combination of reasons relating to private property

rights, economic costs, expected environmental impacts, and inadequate size of disposal areas, the alternative of part-sea and part-land disposal was judged to be both "imprudent and infeasible."

6.34 The possibility of disposal on land sites (either through fill of existing low lying areas or through waterfront land creation, both of which entered into the original estimate) has been re-examined. The areas considered in the FEIS have been re-evaluated, leading to a reduction of potential capacity from 1,662,000 to 706,000 cubic yards for these sites. In addition, the Goss Cove site mentioned in the FEIS has been dropped from consideration. This site is small and difficult of access; it would accept a maximum of 17,000 cubic yards of material, which could only be deposited at considerable cost and at unacceptable environmental hazard because of the lack of sufficient land for use as a settling pond before discharge of water contained in the spoil to the Thames. Acquisition of private property rights would also be necessary. Elimination of this small parcel further reduces the sites discussed in the FEIS to a revised estimated capacity of 689,000 cubic yards.

6.35 However, the new survey has identified other sites, of varying degrees of potential, not considered in the FEIS. All told, the sites considered might accept in the neighborhood of 2,100,000 cubic yards of spoil; of this, 245,000 would consist of waterfront land building and 1,835,000 of inland site placement. It should be noted that this capacity is insufficient to meet Navy needs (2,770,000 cubic yards), let alone total (Navy and non-Navy) anticipated spoil disposal require-

ments of about 5,300,000 cubic yards through 1985. Furthermore, several of the contemplated sites would probably not be available for public use since they are owned by private concerns with their own needs for spoil disposal. (These will be discussed later.) Finally, the costs of utilization of these sites are far in excess of those of disposal at sea. (These differentials will also be discussed below.)

6.36 In a recent study conducted for the Electric Boat Division of General Dynamics Corporation, the engineering firm of C.E. Maguire, Inc. examined costs and feasibility of disposal at five inland and two waterfront sites in relation to projected Electric Boat dredging needs. It identified on-land disposal potential of 990,000 cubic yards at costs ranging from $11.66 to $26.10 per cubic yard; the average cost was $15.11 per cubic yard. The two waterfront sites would accommodate a total of 215,000 cubic yards at costs of $19.95 and $32.24 per cubic yard, for an average cost of $25.49 per cubic yard. Further analysis has led to an augmentation of this capacity estimate by some 800,000 cubic yards on inland sites and 30,000 cubic yards of waterfront land building. Costs for these additional increments of capacity have been estimated at from $10.00 to $11.00 per cubic yard for the inland sites and $8.00 per cubic yard for the waterfront disposal. Factoring these incremental possibilities into the totals earlier identified by the Maguire study yields an average estimated disposal cost of $13.15 per cubic yard for the inland sites, of $24.76 per cubic yard for the waterfront sites and of $14.51 per cubic yard for all sites.

6.37 Since the Maguire study is a proprietary document and certain of the sites considered in it involve private property neither owned nor under lease, option, or other control agreement by Electric Boat, these sites cannot be discussed further in this analysis. However, the others are either under public ownership or belong to Electric Boat, and these may properly be considered in somewhat greater detail here. Figure 6-1a shows the location of sites to be discussed.

6.38 One disposal area along the Thames River is the Hempstead Farms area in Waterford. This property is owned by the Electric Boat Division of General Dynamics. This site, which is zoned Industrial, contains at its southern tip a small section of inland wetland and an adjacent piece of tidal wetland. Part of the site was used as a dump for some 2,000,000 cubic yards of Navy dredging spoil about 15 years ago. The FEIS estimated that this area could accept another 813,000 cubic yards of spoil. The Maguire study is far less sanguine about the site's capacity. It sees a possibility of adding 150,000 cubic yards to the area originally used as a dump; this capacity is related to subsidence of the earlier material in the period since deposition. Capacity to accept an additional 324,000 cubic yards on the property upstream of the old dump is also foreseen by Maguire. Use of the site would require a large amount of construction to refurbish existing containment dikes and to build new ones. (It is worth noting that during the earlier fill operation a dike "blow-out" occurred, leading to the redeposition of about 500,000 cubic yards of material in the river). Use of this site would require barge transport and hydraulic rehandling for any dredging taking place away from the

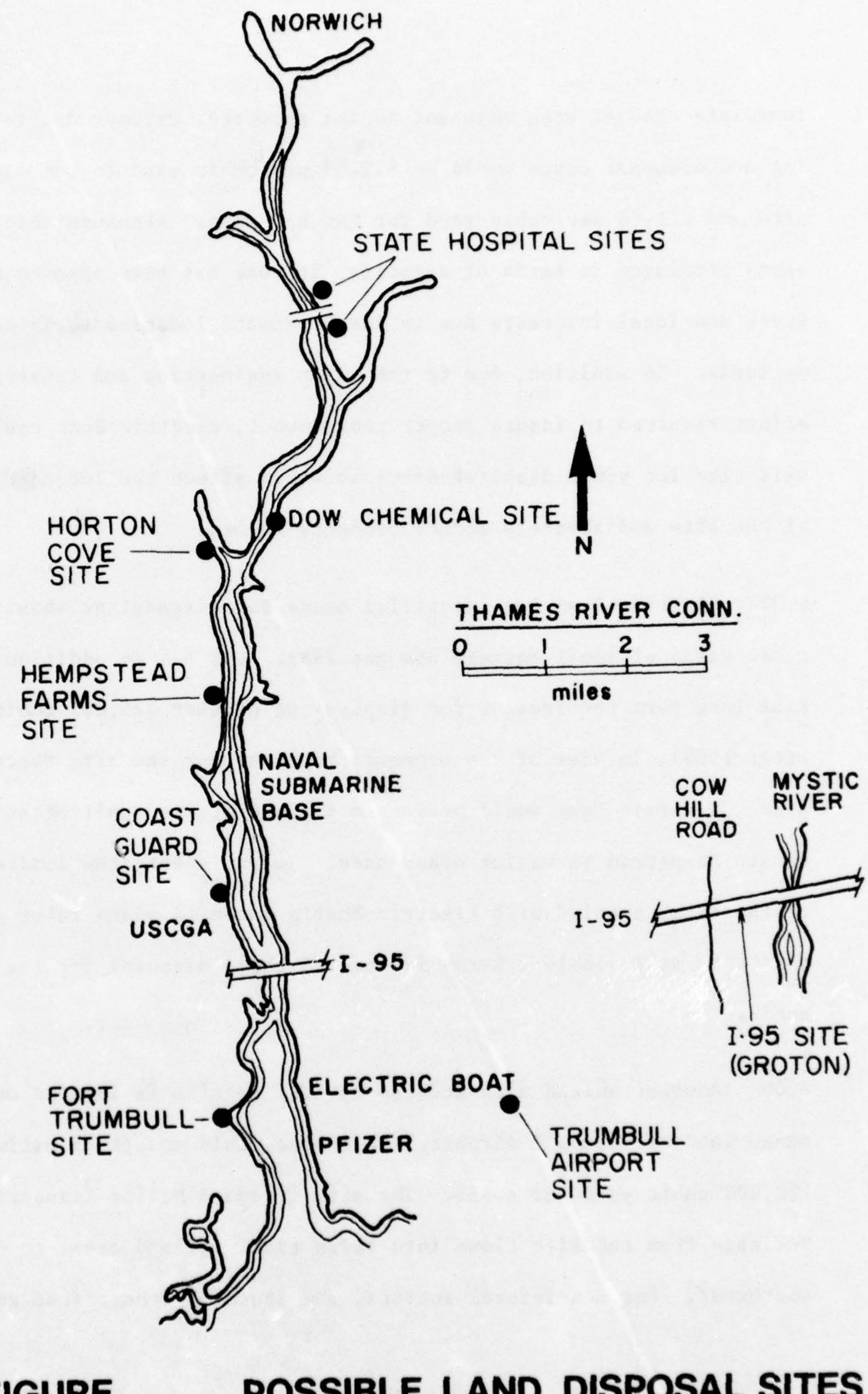


FIGURE 6—1a **POSSIBLE LAND DISPOSAL SITES THAMES RIVER**

immediate channel area adjacent to the property. Estimated total dredging and disposal costs would be $12.43 per cubic yard to the old dump site and $11.66 per cubic yard for the new area. Although this site seems promising in terms of capacity, its use has been opposed by State and local interests due to its proximate location to inland wetlands. In addition, due to the major engineering and construction effort required to insure proper containment, Electric Boat has rejected this site for spoil disposal since it would affect the intended land use of the site and severely reduce property values.

6.39 Electric Boat has identified needs for disposal of about 239,500 cubic yards of spoil between now and 1985. (It has an additional potential long term requirement for disposal of another 425,000 cubic yards after 1985). In view of the economic concerns for the site described above, Electric Boat would prefer to dispose of its spoil at sea and retain Hempstead Farms for other uses. In any event, the limited capacity of the site, coupled with Electric Boat's intended plans rules out this site as a viable alternative to off-shore disposal for the Navy spoil.

6.40 Another inland site studied by C.E. Maguire is located on state-owned land at Trumbull Airport. This area would accept an estimated 150,000 cubic yards of spoil. The site is zoned Medium Industrial. Drainage from the site flows into large tidal wetland areas to the southwest. For non-federal actions, the State of Connecticut could

require that a sediment and erosion control plan be formulated before spoil disposal could proceed. There is no deep water access to the site vicinity, leading to a requirement for overland transport by rail, truck, or pipeline. Maguire concluded that neither rail nor truck delivery from a Thames-side area (the Electric Boat plant in this case) would be feasible. Using the pipeline method would entail costs (including site preparation, monitoring, dredging, delivery, and so on) of \$19.83 per cubic yard. Costs for disposal of Navy spoil from further up-river would certainly be as great or more. Since this site is publicly owned, it could be made available for Navy use. The very limited capacity and the very high costs involved, however, would seem to combine to make it unacceptable as an alternative to at-sea disposal of material dredged by the Navy.

6.41 The Maguire study also considered an inland disposal site in the median between the north and south-bound lanes of I-95 west of the Mystic River. Some additional capacity both to the east and to the west of these sites might be conceivable. However, this site is zoned residential, and the danger of contamination of the Groton water supply system to the west and the Mystic system to the east precludes detailed examination of such possibilities. The excessively high unit costs and the limited capacity of the I-95 median sites also militate against their use as a viable alternative to, or even supplement to, off-shore disposal.

6.42 Three other potential sites not considered by the Maguire study

have been examined. One of these is in the Uncasville section of Montville, off Horton Cove, on the west side of the Thames. The area is currently in active use as a sand and gravel pit. Property to the north of Route 12 is now in residential use. It should be noted that tidal wetland lies between the southern end of the site and the railroad bridge along the River's edge. Of the total area involved (about 25 acres) approximately 12 acres has been sold to Montville for location of a sewage disposal plant, limiting the potential of the site as a whole for spoil dumping. The remaining area (roughly 12 acres) will be used as a gravel pit for about three more years. The gravel removal has led to creation of two ponds on the site, and these will be expanded before operations cease. Under Connecticut law, use for spoil disposal would require that these be refilled with clean material and that the entire area be covered to a depth of five feet above the water table prior to spoil disposal activity. Assuming that this could be done with material available on the site and that the necessary containment and settling pond dikes could also be built from on-site materials, it might be possible to place as much as 500,000 cubic yards of spoil in this pit at a cost of about $11.00 per cubic yard. (Both the cost estimate and the assumption of availability of on-site material are extremely optimistic.) Access to the site is difficult. Horton Cove is shallow, with depths of from one to five feet, while access to the Thames is blocked by a Central Vermont Railroad trestle crossing of the Cove. Development of the site for dredge disposal would require either replacement of the trestle with a drawbridge

and channel dredging in the Cove or hydraulic transport by pipeline from the Thames side of the trestle. The latter possibility seems the more likely. In addition, contact with the operators of the facility reveals an interest in ultimate utilization of the artificial ponds on the site for a marina. This use would entail cutting a connection to the Cove and some minor channel dredging as well. The rail crossing would also have to be converted into a drawbridge. While this site has potential as a spoil dump (and might be found on closer engineering analysis capable of accepting even larger amounts of material than postulated here), it would not provide an alternative to at-sea disposal for more than a small portion of the Navy spoil. In addition, this site would not be available for development and use in time to meet the Navy's needs for disposal under these projects. Assuming that the site should become available, its best role might be for use as a receiving site for private dredging or for maintenance dredging by the Corps of Engineers.

6.43 The other two additional potential sites are closely related. They are located on State Hospital property in Preston, Connecticut. One site is directly south of, and the other directly north of the embankment leading to the Connecticut Route 2A bridge over the Thames River (the so-called Mohegan-Pequot Bridge). Two sites are proposed near the State Hospital in Preston, one to the north and one to the south of Route 2A. Both sites are inactive borrow pits. Land adjacent to the northern site is zoned residential but is currently undeveloped. The southern site is zoned industrial. Land adjacent to the southern site is owned by the State of Connecticut, as are

several other large tracts in the vicinity. Plans are underway to develop a State court complex in the area, but a specific site has not yet been chosen. The sites, each estimated to include about 10-12 acres in area, served as borrow pits for construction of the bridge embankment. Preliminary examinations indicate that each could be used for dredge spoil disposal. Sufficient material for constructing the necessary containment dikes is available on the sites. At a rough estimate, each could accept about 150,000 cubic yards of spoil. The presence of stone groins in the River suggests off-loading of barges by shore-based cranes to dump trucks which could then transport the material to the fill area by existing private roads. This relatively dry method of disposal would eliminate the need for settling ponds common to hydraulic disposal methods. A very rough and tentative cost estimate indicates that the material could be dredged and deposited for about $10.00 per cubic yard; this estimate is subject to confirmation should actual use of the sites be contemplated. Since the land is under control of the State of Connecticut, it could be made available for public use as a spoil dump. Such use might ultimately make these sites available for assignment as parkland, recreation, or hospital expansion.

6.44 However, the area north of the bridge embankment may not be available for other reasons. The original bridge construction plans called for later construction of a second bridge spanning the Thames just upriver of the existing structure. While these plans are currently in abeyance, they have not been completely abandoned. Use of the area as a

spoil dump prior to construction of the necessary embankments would appear to be most unwise; the mechanical properties of dredge spoil make it unsatisfactory as a foundation for such earthwork structures.

6.45 Therefore, any potential use of the more northerly of the two sites would probably be ruled out until the new bridge has been put in place or until its construction there has been definitely abandoned. Assuming that both could be used for the contemplated Navy work, the total capacity they offer of about 300,000 cubic yards would be inadequate in terms of the total spoil to be disposed of under the project of concern here. In addition, these sites are in excess of six river miles upstream of the most northerly dredging planned under this project. Accordingly, it would appear that the State Hospital sites, like the potential Horton Cove site, would be best reserved for disposal of upper river maintenance dredge spoil arising from Corps of Engineers and private projects.

6.46 Several waterfront sites in which spoil could be used for fill to create new land have also been considered. In total they offer a capacity of some 245,000 cubic yards. The first, above the Coast Guard Academy in New London is quite limited in extent. The site is zoned industrial and borders on federal and private property. The Coast Guard has acquired the property on which the Thames Shipyard is currently located and plans to incorporate the land into the Academy facility through a combination of dredge and fill operations. While the potential for fill is fairly large, the filled land is to be used for

later construction. This means that only a limited amount of bottom sediment spoil can be used, after mixture with higher quality materials. The Maguire report (ref. 40) suggests a potential for some 125,000 cubic yards at this site. The cost would be excessive (estimated at $32.24 per cubic yard for dredging and disposal). Inasmuch as the Coast Guard intends to dredge some 190,000 cubic yards of bottom in the immediate vicinity, it would presumably use this if it were to decide in favor of accepting any dredge spoil in its fill areas. In all probability, the Coast Guard would be more apt to choose a fill wholly composed of materials offering more suitable foundation characteristics than dredging spoil. This would suggest that the potential identified here (and cited in the FEIS at 750,000 cubic yards) is for all practical purposes non-existant.

6.47 Another potential waterfront fill site is at the Naval Underwater Systems Center near Fort Trumbull. This site is located on federal property and is zones light industrial adjacent to the site and heavy industrial north of the site. The FEIS postulated a capacity of 82,000 cubic yards here; the Maguire study sees a possibility of depositing up to 90,000 cubic yards. While the new land will ultimately be used for construction, it would appear that it could temporarily be employed for light duty purposes such as parking lots, while the dredge spoil consolidated, and later finished off with higher-quality material. The Maguire estimates indicated a total cost of $19.95 per cubic yard for material originating from farther upstream should be at least as high. As at the Coast Guard Academy, the spoil would have to be mixed with higher

quality fill material, adding sustantially to the material handling costs. It would appear that NUSC would find resorting to all high quality fill both more satisfactory and, in the long run, cheaper than relying on a mixture of dredge spoil and other fill. In addition, the total amount of spoil that might be accommodated (90,000 cubic yards) is small in relation to the total disposal requirement. It would thus appear that this site can also be excluded from serious consideration as an alternative to off-shore disposal.

6.48 Finally, the Dow Chemical plant at Allyns Point upstream from the Submarine Base is zoned industrial and could possibly accept up to 30,000 cubic yards of spoil for use in filling the land behind and downstream of its shipping dock on the east bank of the Thames River. The land so created (about two acres now in shallow water) could be employed for expansion of a small tank farm for chemicals received by water shipment. Since the tanks are constructed on platforms supported by deep pilings, the mechanical properties of the fill would cause no problem. However, Dow is interested in dredging its dockside berthing area and ship turning basin on either side of the main navigation channel. Any filling would be accomplished in connection with such work; this would permit direct transfer from river bottom into the site and eliminate the need for large settling ponds. (This site does not afford room for the latter; a silt trap outboard of the bulkhead drainage might be required, however.) Thus, this small increment of fill remains potentially viable, but only under very special circumstances. It would not affect Navy dredge spoil disposal

to any significant degree, even if available for that purpose.

6.49 While economic factors cannot be allowed to override all other considerations, neither may they be completely neglected. The studies conducted by C.E. Maguire indicate that inland and waterfront disposal of spoil is immensely more costly than dumping in deep water offshore. Unit costs in one case exceeded $30.00 per cubic yard, while in five others were near or in excess of $20.00 per cubic yard. In three other instances, the Maguire estimates were in the neighborhood of $12.00 a cubic yard. The estimates for the additional sites (not considered by the FEIS or by Maguire), which are admittedly on the optimistic side, range from $8.00 to $11.00 a cubic yard.

6.50 In contrast, the Navy has contracted recently for large-scale disposal at the New London dumping site for $3.16 per cubic yard and has estimated that a potential site at East Hole, some 15 miles distant, could be used at a cost of about $4.00 a cubic yard. The Maguire study considered the New London site for future use at an estimated cost of $3.43 a cubic yard and went on to examine a distant, deep water location which would entail a round trip to a point some 96 miles from the dredging site. The latter would require use of heavier transport equipment for the long journey through ocean waters, both to meet regulatory requirements and for reasons of safety to men and equipment. And, of course, the "dead time" for the transport vessels would be much greater than for shorter hauls. Even so, the Maguire study estimated a cost of $10.14 per cubic yard for such distant ocean

area disposal. This was cheaper than any of the landfill alternatives that it examined and compares very favorably with the other alternatives suggested in this document. These price differentials must be taken into account in any decision with respect to selecting among alternative spoil disposal sites. The fact that the land sites are both more expensive than ocean disposal and inadequate to handle more than a fraction of the material to be dumped needs to be given careful consideration in evaluating the alternative of a part-land and part-sea disposal for the Navy spoil associated with this project.

6.51 Summary: The inland and waterfront sites discussed above might theoretically accommodate a total of about 2,100,000 cubic yards of spoil. However, as has been noted in the comment on those sites which have been described, not all of this potential appears to be economically realistic. If one makes the reasonable assumption that disposal costs (from river bottom to final disposition) on the order of $20.00 a cubic yard or more are unrealistic, both the two waterfront sites (Coast Guard and NUSC) and three of the land sites (I-95, Trumbull Airport, and one proprietary site near the Airport) studied by Maguire can be ruled out. (In this evaluation the two I-95 median sites are treated as one.) This leaves a capacity to receive 685,000 cubic yards out of a Maguire total of 1,034,000 cubic yards for all sites considered. The bulk of this capacity (474,000 cubic yards) is at the Electric Boat Hempstead Farms site in Waterford. However, this site is being reserved by Electric Boat for future uses other than spoil disposal and even if this site offered a good possibility in solving the problem of total dredge spoil disposal along the Thames, it would offer little or no assistance in solving the Navy's immediate problem.

6.52 The alternative sites not considered by the Maguire study could offer another 830,000 cubic yards of potential disposal. The State Hospital site south of the bridge embankment looks quite promising, for 150,000 cubic yards; the site north of the embankment appears not likely to be available in the near future, if ever. The Horton Cove gravel pit potential of 500,000 cubic yards, if it should become available, also appears to hold considerable promise, but it is at some distance from the proposed Navy work and will not be available for three years at the earliest. The Dow site at Allyns Point would probably only be available for that company's own use and would not be suitable for large amounts of spoil or for filling by hydraulic methods in any event.

6.53 It might be argued that heavy preparation costs of the Coast Guard Academy site and the Naval Underwater System Center site will be required and that these should not be charged against dredge disposal. Even so, it would appear that the costs of dredging and disposal at these areas would be in excess of $8.00 per cubic yard for an inferior type of fill which would have to be mixed with better materials. In both cases the use of clean fill instead of dredge spoil would probably be more cost-effective for the sponsoring agencies. And, in the case of the Coast Guard, there will be more spoil from its own related dredging operations than can be accommodated as fill.

6.54 Taking all of the above into account, it would appear that a realistic estimate for land disposal potential is under 1,400,000 cubic yards of spoil (table 6-1). This would be inadequate to meet the Navy's im-

ESTIMATED LAND FILL POTENTIAL

	Total	Upland Diked Areas		Waterfront Fill	
	Capacity, Yd^3	No. of Sites	Capacity, Yd^3	No. of sites	Capacity, Yd^3
FEIS	1,662,000	2	830,000	2	832,000
Maguire Study	1,205,000	5	990,000	2	215,000
SEIS total*	2,080,000	8	1,835,000	3	245,000
SEIS revised**	1,365,000	4	1,335,000	1	30,000

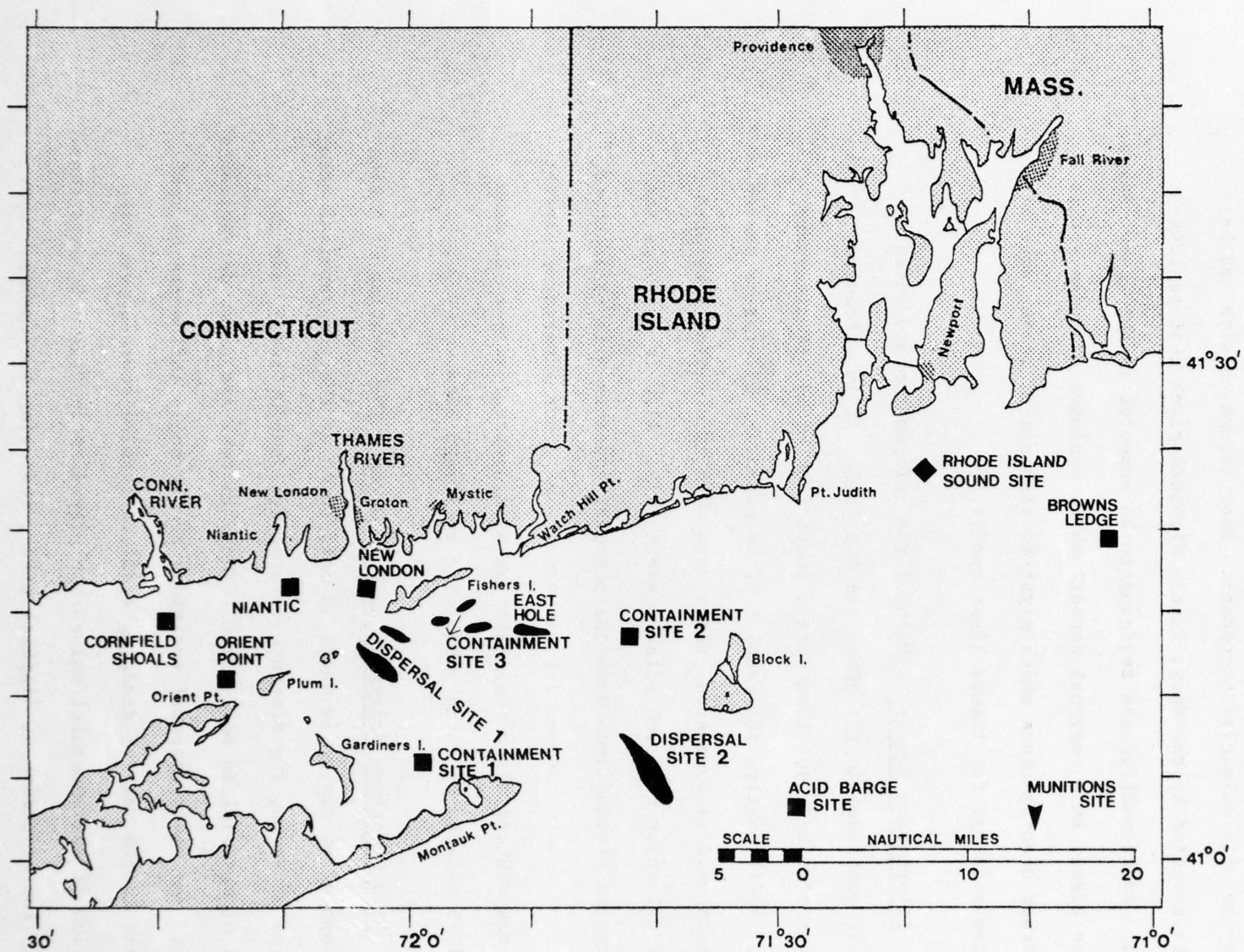
* Includes all Maguire Sites, plus additions
** Eliminates sites felt not to represent reasonable potential for cost or other reasons

TABLE 6-1

mediate needs, let alone the consolidated requirements for all dredge spoil disposal between now and 1985. To the extent that this hypothetical capacity can be, or should be, brought into being, the best use would almost certainly be to meet the needs of private parties and, perhaps, to take care of some maintenance dredging of the upper river. The Horton Cove site, in particular, would seem to merit more detailed investigation by the Corps of Engineers as a potential disposal area in future years.

6.55 OCEAN DISPOSAL. For the Proposed Action, 14 alternative ocean disposal sites (Shown on Figure 6-2) have been considered during the EIS procedure. The Revised Draft Environmental Impact Statement (RDEIS, ref. 248) considered five sites located in Block Island Sound and one (Brenton Reef) located in Rhode Island Sound. At that time, Long Island Sound was effectively closed to dumping by EPA policy. The FEIS (ref. 249) did consider disposal in Long Island Sound and concluded that the New London Dumping Ground was to be the disposal site. A site some seven nautical miles SSE of Block Island (the Acid Barge Site) was proposed as an alternative to be used if monitoring at New London indicated any adverse effects for the disposal. The purpose here will be to assemble the information presented in the RDEIS and the FEIS concerning these eight sites, to present new information on them and seven other sites developed since 1973, and to provide a rational framework for comparisons among them.

6.56 The determination of cumulative impacts must, of necessity,



OCEAN DISPOSAL SITES

FIG. 6-2

follow the site selection procedure. Even though no site can be finally selected by the Navy, likely disposal sites must be identified. Additionally, the dredging to be expected in the Thames River must be placed in a regional context which includes dredging spoils from other near-by areas which might be disposed of at the same site or sites selected for Thames River spoils.

6.57 Information Sources Much of the information presented below is contained in the RDEIS and the FEIS. It is extracted and presented here to allow direct comparison of all 14 Alternate Sites. Additionally, the results of an extensive literature search have been used to supplement these data with information developed in several major research efforts since 1973. Also included is the information gleaned from numerous personal contacts with researchers, regulatory agents, commercial fishermen, and other interested parties. These new sources allow the selection of a disposal site to be made on a 1975 data base, rather than on a 1973 data base.

6.58 Site Selection Criteria and Procedures The location of a site for disposal of any solid waste is influenced by the geographical area, the type of waste, the distance to proposed dumping areas, and the volume of material to be handled. These factors are prime determinants of cost, and waste disposal decisions are strongly influenced by cost factors. In the case of dredging spoil, a growing concern over preservation of environmental values has played an increasingly important role in the selection of disposal sites, lessening the formerly pre-

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FINAL ENVIRONMENTAL IMPACT STATEMENT, DREDGE RIVER CHANNEL: NAV--ETC(U)
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dominant role of economic factors. Until approximately twenty years ago, it was common practice to deposit dredge spoil on nearby lowlands as land fill. Dikes were often used to contain the material until it had consolidated. Ocean dumping was resorted to when this method was cheaper than landfill, which generally was true only when there were no low lying areas in the immediate vicinity of the dredging operation. In other words, dumping at sea tended to be chosen because it was cheaper than landfill not because it offered any other inherent advantages. However, the filling of coastal areas (which usually are tidal wetlands) has proven to be an environmentally harmful practice because of the great ecological importance of wetlands in estuarine and offshore fisheries. Accordingly, dumping at sea has grown in importance as a disposal method.

6.59 Over a period of time, a number of offshore dumping sites (120 for the United States as a whole) have been designated by the U.S. Army Corps of Engineers. Such sites have been primarily used for disposal of dredge spoil which accounts for about 80 percent of the total tonnage of wastes dumped in the marine environment. The chief criterion for designation of sites was location at a reasonable distance from the coast in places where the material deposited would not be expected to interfere with recreational uses, navigation, or fisheries. In practice, this often dictated sites close to dredging activity. For example, two such sites were located in Long Island Sound in close proximity to the Thames River and three were located in Rhode Island Sound off Newport below Narragansett Bay. Assuming that economic or

other factors ruled out direct deposit on nearby lowlands by hydraulic transport, the spoil from a dredging project was barged to the closest designated dumping ground.

6.60 Today, however, site selection is a more restricted process. Direct costs, which in practice are primarily a function of transport distance between dredging site and disposal site, are still significant but no longer are ruling in decision making. The environmental cost also has to be considered to insure compliance with legislation and ensuing regulations. The chemical and physical nature of the spoil has to be considered. The fishery and other commercial values of the proposed disposal area must be taken into account. The biological health of the area (as evidenced by benthic fauna as well as by demersal fish populations) is of significance; by and large a non-productive area is preferable to one that is highly productive. In any case, the ultimate fate of the material must be considered: will it remain concentrated in one location, will it gradually move out to adjacent areas with possibly deleterious effects, or will it be rapidly diluted and dispersed over a semi-infinite portion of the ocean bottom? Thus, many factors play a part in the disposal site selection process.

6.61 Of these factors, the simplest is the economic. For sites along the immediate coast where the Coast Guard's "Inland Rules of the Road" govern navigation, disposal cost varies directly with transport distance between dredging and disposal sites. Outside of this legally defined area, regulatory requirements (and the rougher seas encountered in

unprotected open waters) dictate the use of heavier vessels and more extensive, hence expensive, safety equipment. By far the largest portion of the cost for dredging, transport, and disposal is fixed and not related directly to transport distance. However, there are incremental costs per mile of transport of the material; there is also a cost differential between "inland water" and "open water" transport. Accordingly, it may be cheaper to carry spoil to a disposal site at say, 50 miles distance where the entire passage takes place in inland waters than to a site five or more miles nearer in ocean waters. In general, save for the additional incremental costs of ocean transport, the water site closest to the dredging will always be preferable in economic terms. Incremental transport costs to a distant inland waters site, for example, could increase the total cost of dredging, transport, and disposal for Thames River spoil by more than 50 percent over those entailed by use of a nearby dump. Differentials of this magnitude are not sufficient to force selection of a site where other factors strongly favor the more costly choice, but they must be taken into account in making a final decision.

6.62 The physical features of a specific disposal site, with the exception of its distance from the location of the dredging activity, do not work any major effect on the economic cost of disposal. They may, however, be of substantive importance in the assessment of environmental cost of the disposal. It is in large part the physical features of the site which determine the ultimate disposition of the material which is dumped there, and it is that final disposition

that one must know to adequately assess the environmental impact of the operation.

6.63 The most obvious and generally the most stable of the physical features of any site is its bathymetry. The contour of the bottom is one of the factors of significance in determining whether or not material deposited there will remain or be spread over a larger area. It is also these same contours that may be the most permanently altered features following disposal; either low spots will disappear or new elevations will be created on relatively flat ocean bottoms. An important element of the physical aspects of a site is its geologic history. More specifically, is it an old feature that is gradually changing (filling or eroding) or a contemporary feature that is apt to stay in its existing configuration? In early discussions of ocean disposal it was common to look to known areas of depression as potential dump sites. Only further assessment on a site-specific basis can establish the validity of such a preliminary site designation.

6.64 The bathymetry of a particular location will exert a major influence on both the direction and speed of the currents in the vicinity of the site. In the study area there is a very complex pattern of currents in operation. An understanding of current patterns is an essential element in the projection of the behavior of dumped dredge spoil. In fact, in given instances there is a interrelationship between the currents and the contour of the bottom; for instance, the bottom may have its shape because of scouring currents and, in turn, the

current speed and direction may be influenced by the shape of the bottom. Alteration of either factor may lead to direct alteration of the other.

6.65 In a limited fashion the meteorology of a site is a necessary element to consider. Larger than normal waves generated by storms can temporarily cause the dispersion of otherwise "contained material."

6.66 The sediments of a site prior to spoil deposition may be a factor of considerable significance in the environmental assessment, particularly if information about current patterns and velocities is either non-existent or marginal. If the bottom sediments constitute a marketable resource in the form of sand and gravel deposits that could be excavated, that potential should be considered in the overall assessment. Analysis of the sediments, in particular their grain size and vertical and horizontal distribution, can also provide valuable information on current direction and velocity.

6.67 The designation of a site as either containment or dispersal is intended to describe the behavior expected of spoil dumped in that location. The assumption is that spoil will remain where it is dumped in a containment site and will be widely distributed in a dispersal site. Each site under consideration is assumed to have characteristics which will place it in one of these two categories and that category placement will be a part of the specific and detailed site description.

6.68 Dumping of spoil will inevitably involve the fauna of a specific

site. In general terms, consideration may be given to two groupings of fauna, those occupying the water column above a site and those that inhabit the bottom or near-bottom. The disturbance of those species which occupy the water column can most often be considered temporary and essentially restricted to the period of active dumping. The exception would occur if the spoil contained material which would leach to the surface over a long period of time. For the species associated with the bottom the impact is generally more dramatic and long lasting. Creation of a "new" bottom as a result of spoil dumping may kill the less mobile species resident there and thus may eliminate a food source for the non-resident users of the area. This is substantiated by the Environmental Protection Agency's Interim Regulations on Discharge of Dredged or Fill Material into Navigable Waters (40 CFR 230, September 5, 1975) which states that "...use of existing disposal sites is generally desirable."

6.69 In the commonly accepted context, site use is described in terms of those activities carried out by man in the area. The ramifications of disruption of these activities may be significant both in terms of time and data lost as well as in terms of dollar-income lost either temporarily or permanently. Among those uses known to exist within the study area are charter boat sport fishing, commercial trawl fishing, commercial shellfishing, private fishing, operation and testing of submarines, aquatic research, acoustic research, and spoil dumping.

6.70 Finally, any assessment of a site or sites had to consider the

body or bodies which have legal jurisdiction over the area. This facet of the study area is also very complex. Four states, Rhode Island, Connecticut, New York and Massachusetts claim jurisdiction over one or more of the 14 sites in the study area. In addition, permission to dump at any one of the sites would involve the U.S. Army Corps of Engineers. Prior activity at certain of the sites under consideration has resulted in litigation and ensuing court orders restricting, at least temporarily, the use of those sites as disposal areas.

6.71 Environmental Context. Practical considerations dictate that any disposal site for Thames River dredge spoil be located within some "reasonable" distance of the mouth of the Thames. This limits the potential area to be considered to Long Island Sound, Block Island Sound, Rhode Island Sound, the continguous sea near these water bodies, and the land masses that define them. This is a large area. The selection of candidate disposal sites within it must take into account the physical, biological, and socio-economic aspects of the human environment which may be affected by such a choice.

6.72 The spacing of active spoil sites along the coastline helps to delimit a reasonable study area. The New Haven Dumping Ground is the nearest major site to the west of the Thames. The Connecticut River is half way between the Thames and New Haven. Thus, Cornfield Shoals (off the mouth of the Connecticut) is a reasonable western terminus for the study area. There are no active disposal sites within Block Island Sound, so that it was included in the study area and marks

a reasonable eastern limit. The Rhode Island Sound Site (Brenton Reef), however, was a preferred site in the Revised Draft Environmental Impact Statement (ref. 248) and is included here. Other, more distant sites (such as Browns Ledge and the Munitions Dump) were included because they were the subjects of discussion at earlier hearings on the project. Ordinarily, they would be too distant for serious consideration.

6.73 The 14 Alternate Sites for ocean disposal of Thames River dredge spoil might be studied in any of several frameworks. They could, for instance, be considered solely on a micro-site basis and ultimately must be, if a choice is to be made among them. This, however, is not sufficient because it does not allow consideration of possible influences on the area adjacent to a site or the area between the Thames River and the selected site. To address these concerns, the study area for the SEIS includes eastern Long Island Sound, Block Island Sound, Rhode Island Sound, and open ocean areas south of Block Island. The study area is bounded on the east by Narragansett Bay (longitude 71° 10' west), on the west by the mouth of the Connecticut River (longitude 72° 20' west), on the south by latitude 41° north, and on the north by the coast lines of Connecticut and Rhode Island.

6.74 <u>The Physical Environment</u> - Bathymetry. Long Island Sound (LIS), east of Six Mile Reef, is shallow and relatively featureless, with the exception of Long Sand Shoal. Long Sand Shoal lies southwest of the mouth of the Connecticut River, extending westward approximately 6 miles. Portions of the Shoal are within 7 feet of mean high water.

Water depths in eastern LIS reach 270 feet in areas west of the Race. Two channel-like depressions elongated in a southeasterly direction connect LIS and Block Island Sound (BIS). These channels are the Race and Plum Gut. The Race is divided by Valiant Rock, which lies at approximately 18 feet MLW. The channel between Fishers Island and Valiant Rock has depths in excess of 250 feet. Depths in excess of 190 feet exist in the main navigational channel at Plum Gut.

6.75 Block Island Sound separates Block Island, R.I. and Long Island, N.Y. and extends southward from the Rhode Island-Connecticut shoreline to the Atlantic Ocean. The mean depth of BIS is about 130 feet. The deepest spot is located south of Fishers Island (West Hole) and is approximately 325 feet deep. The bottom of BIS generally slopes downward from Fishers Island and the mainland toward Block Island. Block Canyon intrudes into BIS between Long Island (Montauk Point) and Block Island. This channel has a maximum depth of approximately 150 feet within BIS as described by Williams (ref. 265). The area of BIS which connects with Gardiners Bay and Napeague Bay is much shallower and relatively featureless.

6.76 Bathymetric charts of Rhode Island Sound (RIS) show a gently sloping bottom topography, whose depth rarely exceeds 120 feet within ten miles of the mainland. Bottom contours indicate that, prior to the last rise in sea level, there was a river valley between East Ground and Cox Ledge. Several flattened submerged ridges suggest that a segment of the Ronkonkoma Nantucket moraine trends across RIS between

Block Island and Cox ledge. East of Cox Ledge is a depression known as Mud Hole, in which water depths are recorded at 180 feet.

6.77 Sediments. The distribution of sediments within the boundaries of the study area has been covered in detail in the FEIS, sections 2.15, 2.16, and 2.22. Studies by McMaster (ref. 132) and Savard (ref. 187) were used to generate sediment distribution maps. Subsequent to the preparation of the FEIS, a sediment classification of eastern Block Island Sound, using seismic reflectivity, was carried out by Danbom (ref. 61). Gallagher at NUSC (ref. 83) has monitored a 19 mile length of water between Mt. Prospect on Fishers Island, New York, and Great Salt Pond on Block Island, Rhode Island. He sampled bottom sediments using a piston coring device and performed mean grain size analyses.

6.78 Savard considers clean, moderate to poorly sorted sand to be the dominant sediment type in BIS, with silt and clay generally restricted to the submerged plain west of Block Island and to Napeague Bay in the southwest part of the Sound. Danbom (ref. 61) also mapped an area west of Block Island as an area containing sediments of small grain size (coarse silt), as compared with surrounding sediments. Savard believes this area to be a delta type deposit formed at a time of lower sea-level.

6.79 In the area between Block Island and Gardiners Island two significant features are found. These consist of a series of sand waves and an area of mud and silt rich in organic matter. These areas were

detected in seismic transects run by Bertoni (ref. 12). The position and seismic characteristics of the mud and silt area suggest lagoonal, estuarine, or peat deposits.

6.80 Sand waves are found south of Fishers Island in water between 75 and 100 feet deep. Bertoni (ref. 12) suggests a N-S trend (wave crest orientation), asymmetrical with the slipface to the east, indicating migration to the east probably under the influence of ebb currents.

6.81 Frankel and Thomas (ref. 73) have found clay concretions in an area of BIS known as East Hole. These concretions may have formed on the site; however, Bertoni considers them to have originated in freshwater clay deposits along the Connecticut River Valley. McMaster (ref. 132) considers the predominant sediment of RIS to be clean, well-sorted sand. East of Point Judith, he has mapped a large depositional area of sandy silt with less than 10 percent clay. Significant amounts of sand and gravel exist in discontinuous glacial moraines which cross RIS. The areas of highest gravel and sand/gravel concentration are off Sakonnet Point and southeast of Block Island. Morainal deposits are evident across southern RIS and further north between Point Judith and the Elizabeth Islands.

6.82 Sediments of eastern Long Island Sound have been studied by McCrone et al. (refs. 130, 131), Donohue and Tucker (ref. 69), Buzas (ref. 38), Grim et al. (ref. 97), Bokuniewicz et al. (ref. 19) and others. Cores have been taken in various areas of eastern LIS by the U.S. Army Coastal Engineering Research Center (Williams, 1976,

personal communication). Sediments in the area are primarily sand (> 70%) with occasional lenses of silts and clays. Metal concentrations in LIS sediments have been examined by Dehlinger et al. (refs. 64, 65). They indicate that up to 90% of the copper and zinc which enters the Sound may end up in the sediments suggesting that sedimentary metal removal is a means of buffering the concentrations of metals in coastal waters. They postulate that the sediments of Long Island Sound are acting as a significant sink for copper, zinc and other metals.

6.83 The distribution of sediments in the study area is due partially to the transport capabilities of tidal currents. Exceptions to this would be several bathymetric lows in the western part of BIS which may act as sediment traps. A comparison between published current data and the distribution of gravel-size sediments, however, shows that the strongest tidal currents exist in these areas. In all probability, these gravel deposits are reworked glacial material from which the fines have been winnowed. McMaster (ref. 132) found that the gravel is concentrated along two submarine ridges trending across BIS. He interprets this as being a result of previous environmental conditions being modified by present hydraulic conditions.

6.84 Sand and coarser sediments are found in areas where bottom currents are generally actively eroding and transporting materials. In several locations of the study, however, current conditions do not favor sediment erosion and transport. These areas are usually comparatively rich in fine sediments (silts and clays) and exhibit

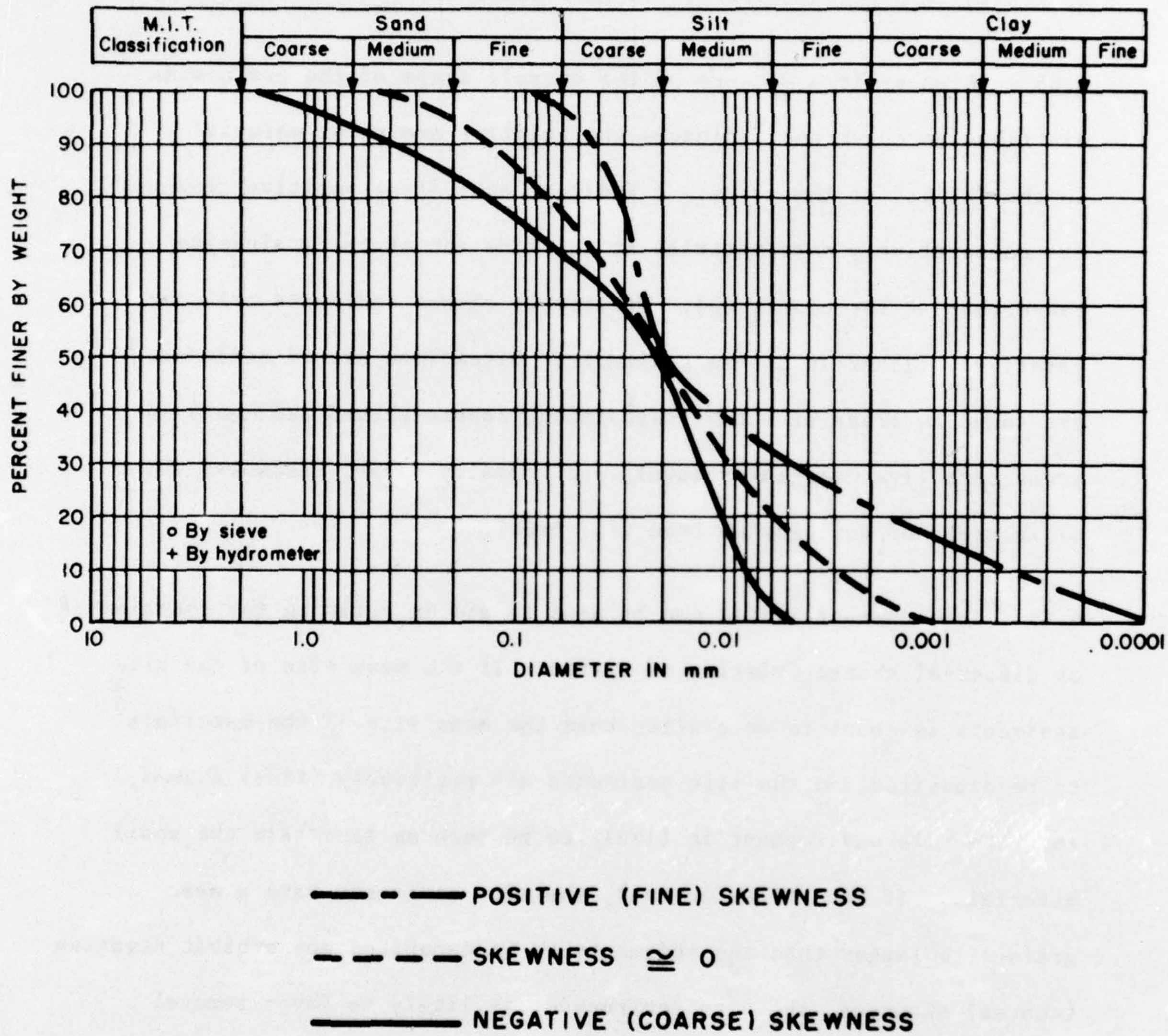
grain-size curves that are of different character than those for coarser sediments often associated with an erosional environment. The statistic of measurement for this difference is called "skewness" and is discussed at length in Section 2.16c of the FEIS (ref. 249).

6.85 Skewness is a measure of the overall shape of the grain-size distribution curve and indicates the relative amount of material in the "tails" of the curve. A sediment exhibiting positive skewness has comparatively more material at the fine end of the grain-size range than at the coarse end. Negatively skewed sediments are comparatively richer in coarse sediments. Often fine-skewed sediments are found in areas of active deposition, coarse-skewed sediments in areas of active material removal, and normally skewed (skewness about 0) in areas of equilibrium (see fig. 6-2a).

6.86 This characteristic can be used to aid in defining the containment or dispersal characteristics of a site. If the mean size of the site sediments is equal to or smaller than the mean size of the materials to be deposited and the site sediments are positively (fine) skewed, then the site environment is likely to be such as to retain the spoil materials. If, on the other hand, the site sediments have a mean grain-size larger than the sediments to be deposited and exhibit negative (coarse) skewness, the site environment is likely to favor removal of the spoils.

6.87 Currents. A general discussion of currents and circulation in the Block Island Sound-eastern Long Island Sound area was presented

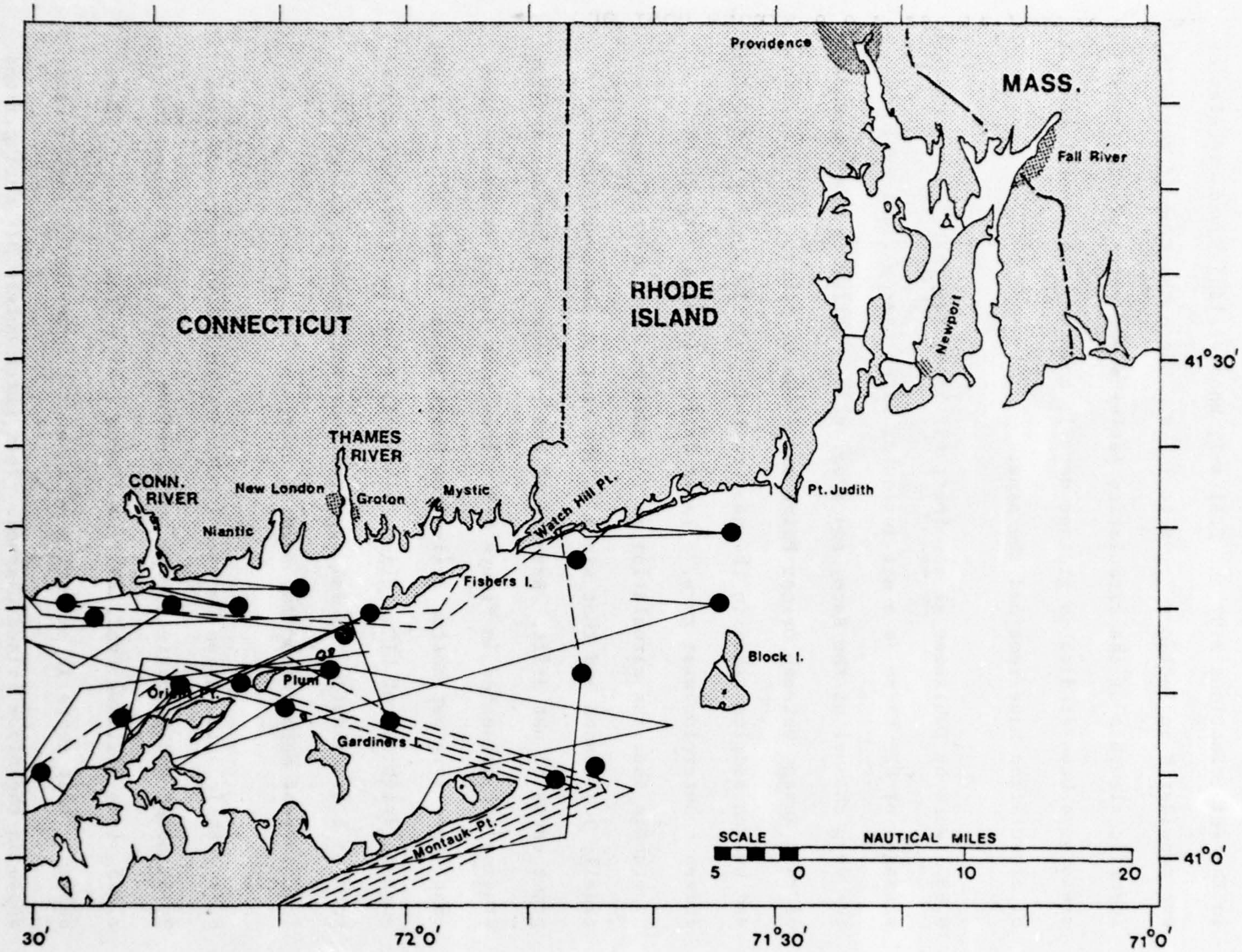
GENERALIZED SKEWNESS CURVES - FIGURE 6-2a



in the FEIS, Sections 2.02 and 2.11 a-f; Rhode Island Sound circulation was considered in Sections 2.19a to 2.19d. Since the time of the FEIS, specific elements of the circulation patterns for parts of the study areas have been studied in greater detail; however, the general concepts of circulation have remained the same.

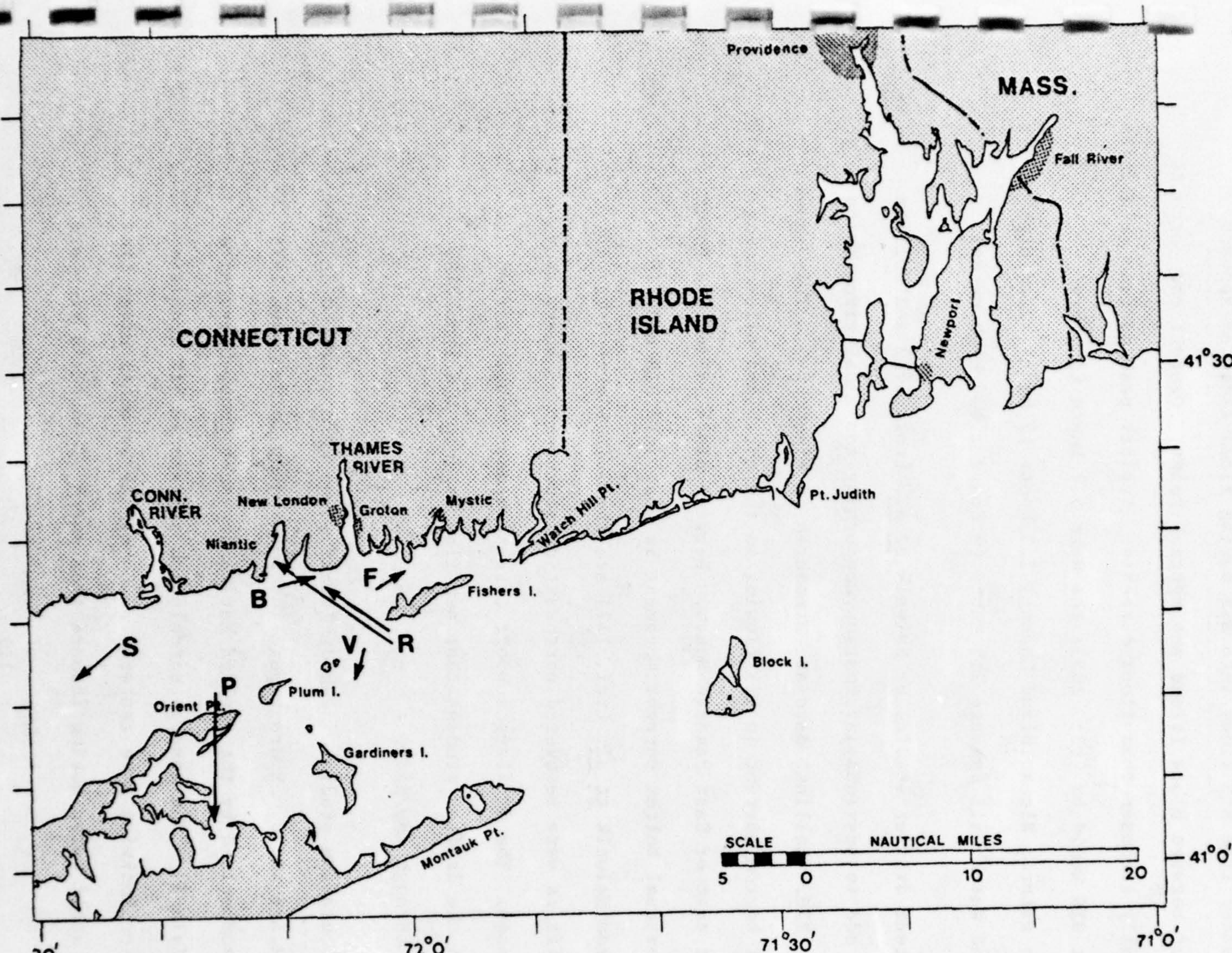
6.88 Work by Dehlinger et al. (ref. 65) indicates that "In the eastern passages of LIS there is a net inflow of water over a tidal cycle in the deep channel of the Race, and a balancing outflow in the remainder of the passage between Orient Point and Fishers Island. Measurements and bottom samples taken in the eastern third of LIS suggest a tidally driven counterclockwise gyre." Their drifter studies support the hypothesis that the circulation in the eastern third of the Sound is tidally influenced and that winds in the rest of the Sound are the prime cause of net drift. Results of their seabed and surface drifter studies are presented in Figure 6-3. From this Figure it can be seen that there is a net bottom drift from Block Island toward LIS and a net surface drift out of LIS. Figure 6-4 (ref. 65) illustrates net transport in 2 ft /tidal cycle and resultant current vectors, calculated from current meter data, for several sites in LIS.

6.89 Basic information for tidal currents in BIS was obtained from U. S. Coast and Geodetic Survey publications, from the FEIS section 2.11d, from Williams (ref. 265), and from Ichiye (ref. 104). Ichiye believes that there is an influx of subarctic water below the 21-meter depth in the Block Island Channel. This water enters BIS during flood



DRIFTER STUDY RESULTS, 6-18-73
(DEHLINGER et al., 1974)

FIG. 6-3



NET TRANSPORT AT CURRENT STATIONS

(Dehlinger et al., 1974)

R= Race Stations
V= Valiant Rock Station
F= Fishers Island Station
B= Black Point Station
P= Plum Gut Station
S= Long Sand Shoal South Station

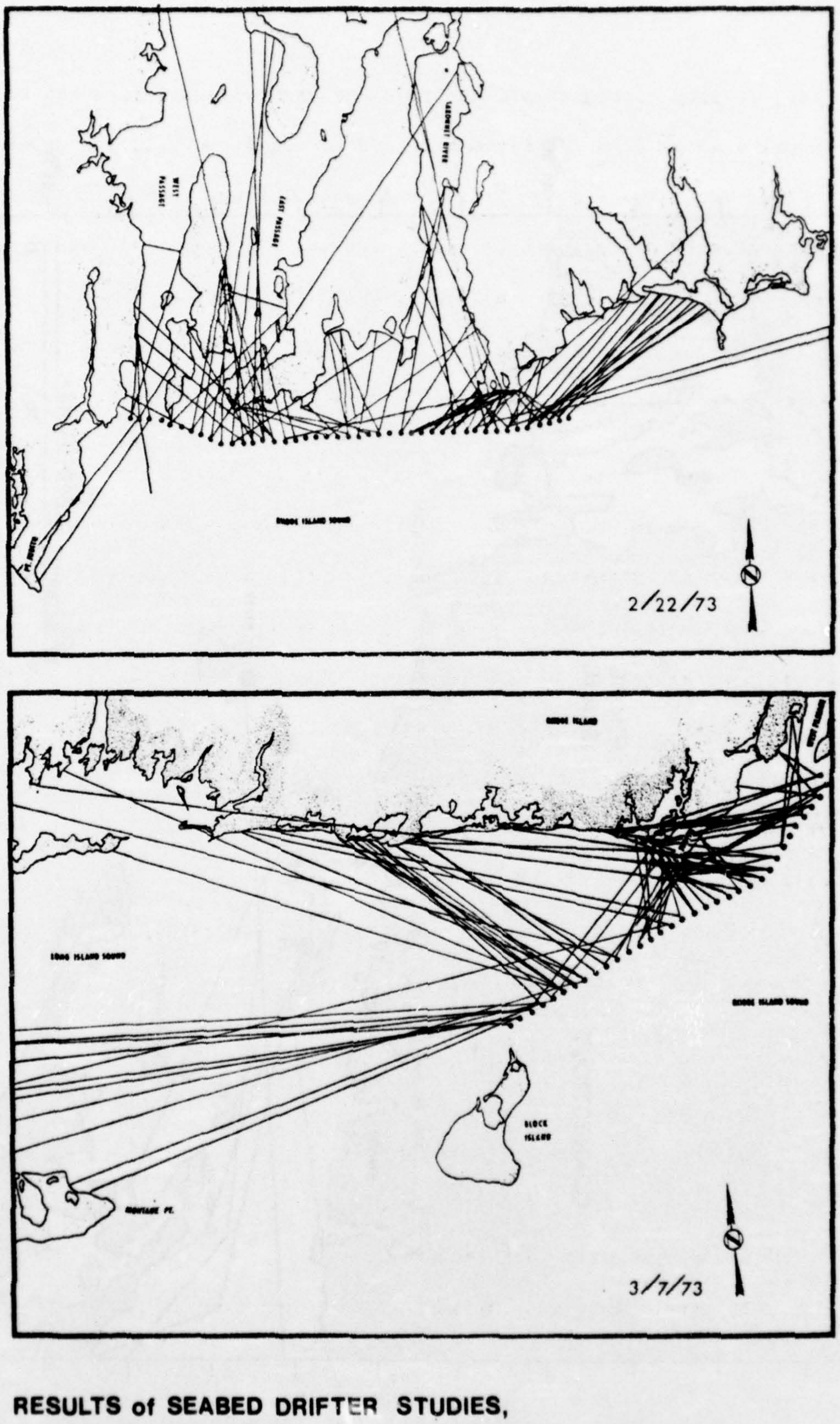
← One inch equals 8.6×10^6 ft^2/tidal cycle.

FIG. 6 – 4

tide, flowing northwestward and then eastward at subsurface levels. Incoming water from RIS flows into BIS during flood tide and appears to flow out between Block Island and Montauk Point. Overall ebb currents are generally stronger than flood currents. Typical peak current velocities throughout BIS would be (ref. 265): the Race 5.2 knots (3 hours after high water); Block Island Channel 2.5 knots (3 hours after high water); and Watch Hill Passage 2.5 knots (3 hours after high water).

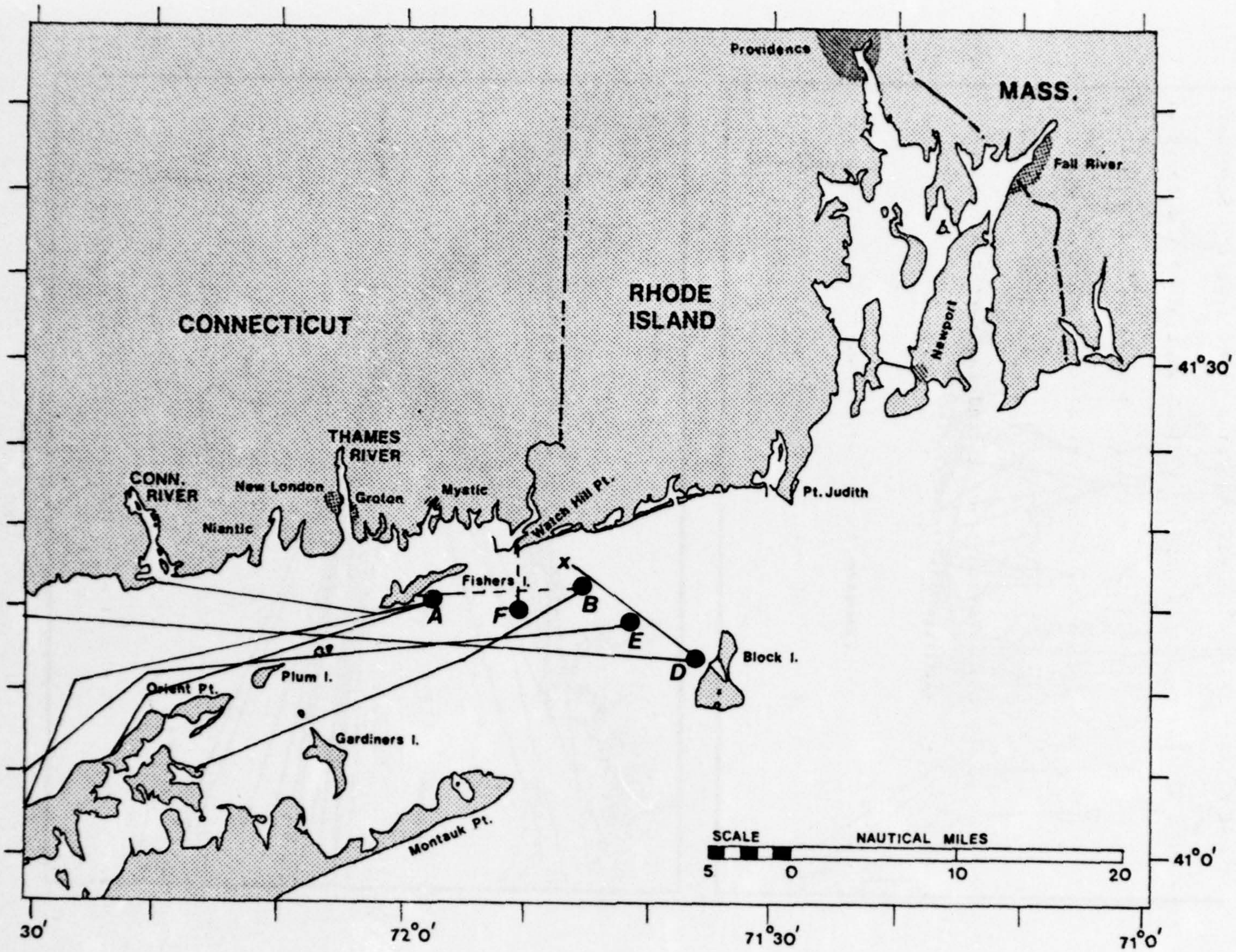
6.90 Recent drifter studies by Nalwalk et al. (ref. 147) and Collins (ref. 46) add to previous information concerning non-tidal circulation in BIS and RIS. Collins' data are presented in Figure 6-5. This shows a residual bottom current in RIS flowing to the north and bifurcating at a point east of East Passage Mouth. Between Block Island and Point Judith, residual bottom current movement is west into BIS and LIS. Results from Nalwalk et al. (ref. 147) are shown in Figure 6-6. All of the drifters were recovered northwest or southwest of where they were released. The drifters support current measurements carried out along with the drifter studies that net flow is into LIS from BIS, primarily through the Race.

6.91 Circulation studies in Rhode Island Sound were detailed in FEIS, Sections 2.19a and c. Hydrographic information up to November 1975 has been summarized by the Applied Marine Research Group-University of Rhode Island. "The general circulation pattern in RIS consists of a counterclockwise gyre centered south of the Sakonnet River (ref. 57). The shelf water moving inshore from south of Martha's Vineyard



RESULTS of SEABED DRIFTER STUDIES, RHODE ISLAND SOUND and NARRAGANSETT BAY, 1973

FIG. 6-5



DRIFTER STUDY RESULTS, 6-20-73
(NALWALK, et al., 1974)

FIG. 6 – 6

moves north along the eastern side of RIS, giving off waters to Vineyard Sound and Buzzards Bay. The eddy entrains water from the Sakonnet River and from Narragansett Bay as it flows west along the coast of Rhode Island. The circulation then circles south and may receive water from between Block Island and Point Judith except in the summer, when it gives off water to the west. Prevailing winds drive a portion of this water to the east between Block Island and Martha's Vineyard, flowing north to complete the cycle," (ref. 208).

6.92 In situ bottom current studies subsequent to the FEIS have been carried out by personnel of the Naval Underwater Systems Center (NUSC) at Newport, R.I. These studies include work at East Hole and West Hole by Cook and Morton (ref. 58), New London and East Hole by Morton, Cook and Massey (ref. 140) and the Long Sand Shoal Dumping Ground by Morton and Cook (ref. 139). Pratt et al. (ref. 173) at URI have completed similar studies at the Brown's Ledge site.

6.93 Laboratory studies regarding the erodibility of Thames River Sediments have been carried out by Nacci, Kelly, and Gularte (refs. 143, 144). JBF Scientific (ref. 106) has carried out laboratory studies of the characteristics of dredge spoil material.

6.94 Tidal current measurements carried out by URI in eastern RIS (ref. 173) indicate the major axis of tidal ellipses to be oriented NNW-SSE. They recorded a maximum tidal current speed of 0.5 ft/sec. (spring tide). Measurements of non-tidal drift velocity, near bottom, average 0.5 miles/day.

6.95 The final current-producing mechanism which must be considered is large waves. These can generate significant bottom velocities, especially in shallow water. The formation of large waves (with the exception of tsunamis) is generally the result of persistent winds associated with storms. While meterological data for ocean areas are not as complete as for land areas, there is sufficient information to allow some estimates of storm-induced wave activity. These data have been collected by the U.S. Naval Weather Service Command, based on the logs of ships sailing in coastal waters between 1922 and 1968, and were published in the Summary of Synoptic Meteorological Observations (SSMO, ref. 247). SSMO Areas 5 and 6 contain the entire study region. Area 5 includes Rhode Island Sound and most of Block Island Sound (east of longitude 72). Area 6 covers the remainder of Block Island Sound and all of Long Island Sound.

6.96 The SSMO includes two sets of Tables which are of particular interest in assessing storm-induced wave activity. These are a tabulation of wind speed and direction versus wave height and a tabulation of wave height versus wave period. The bottom velocities associated with such waves can be computed from the wave height and wave period.

6.97 Table 6-2 is a summary of the wave height data presented in the SSMO. The highest waves which have been observed in the study areas range from 26 to 32 feet, and are associated with winds from the North and Northwest and from the South and Southwest. Waves of this magnitude are quite rare. In Area 5 (Block Island and Rhode Island Sounds)

TABLE 6 - 2

Wave Height Summaries

Highest Observed Waves

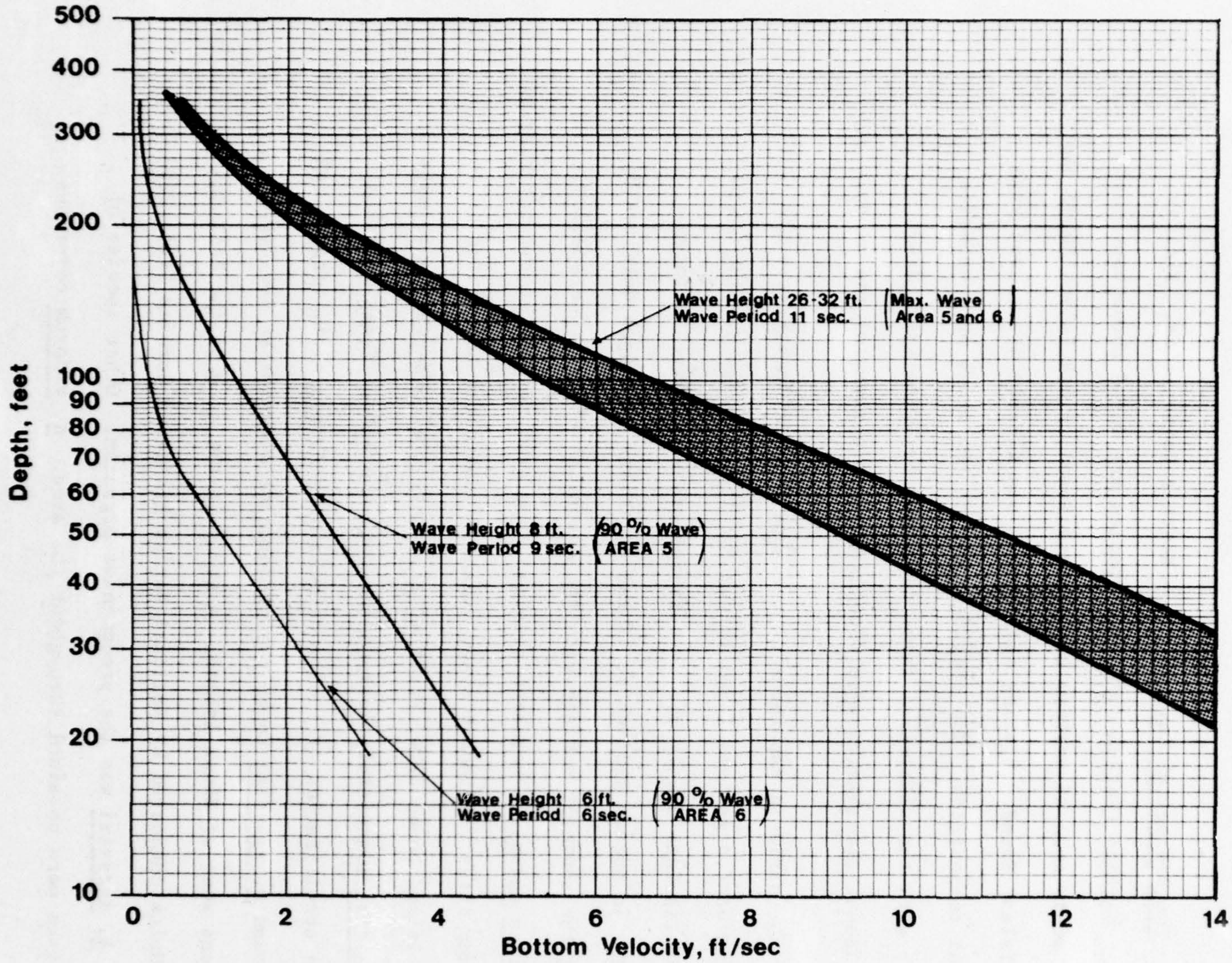
Direction	Area 5	Area 6
North	20-22 feet	26-32 feet
Northeast	17-19 feet	20-22 feet
East	13-16 feet	10-11 feet
Southeast	13-16 feet	13-16 feet
South	26-32 feet	13-16 feet
Southwest	23-25 feet	26-32 feet
West	23-25 feet	17-19 feet
Northwest	26-32 feet	26-32 feet

there were only 2 such observations recorded in the period of record. In fact, 90% of the observations of wave height were less than 8 feet. In Area 6 (extreme western Block Island Sound and Long Island Sound) 26 to 32 foot waves were recorded only twice, as well. In this Area, 90% of the observed waves were less than 6 feet high.

The periods associated with the large waves in Area 5 were between 8 and 11 seconds. The more common 8 foot waves had an associated model period of 6 seconds.

6.98 These wave heights and periods can be used to calculate the bottom velocities induced by their passage. The largest waves (26-32 feet) represent a rare worst case. The 90% waves show conditions which can be expected to occur fairly frequently. Figure 6-7 shows the induced bottom velocity for various depths associated with these waves. The sinusoidal wave equations (as presented in the Corps of Engineers Shore Protection Manual, ref. 215) were used to derive this figure. A wave period of 11 seconds was used for the worst-case waves because it yields a higher bottom velocity than shorter periods.

6.99 The results of this calculation allow a rough comparison to be made among sites of differing depths. In particular, the induced bottom velocity is reduced in all cases as depth increases. The influence of the rare waves, however, can be quite severe even at substantial depths. Velocities as high as 7 feet per second might be found in waters 100 feet deep. The velocities associated with the more common waves are much less, ranging from about 0.2 to 1.2 feet per second in 100 foot depths. These



WAVE - INDUCED BOTTOM VELOCITIES vs. DEPTH

FIG. 6-7

observations, on a site-by-site basis, will be used as one of the ranking criteria for disposal sites in paragraphs 6.359 through 6.426.

6.100 The Biological Environment - Benthic Communities. Similar types of benthic (bottom-dwelling) species are found throughout most of the study area of eastern Long Island Sound, Block Island Sound and Rhode Island Sound. Species composition was closely associated with sediment composition. The species found in the study area coincide closely with the silty-sand fauna described by Pratt (ref. 174). Other faunal assemblages were recognized within areas of the study.

6.101 Gammaridean amphipods of the Ampeliscidae family were the most dominant organisms found throughout the proposed dumping areas. The Ampeliscidae family are deposit-feeders which live in tubes embedded in bottom sediments. These organisms feed upon detritus by raking the sediment surface with the second antennae. One species, *Ampelisca agassizi*, has been obtained from grab samples at the majority of the dump sites. Although other organisms dominated the center of the Rhode Island Sound Site, Pratt *et al*. (ref. 176) observed dense mats of *A. agassizi* immediately surrounding the dump site. These mats can aid in stabilization of spoils colonized by *A. agassizi*. Franz (ref. 74) found *A. agassizi* to be the predominant organism at two sample stations west of Block Island. A study in the area of the East and West Holes conducted by National Marine Fisheries Service (ref. 226) found *A. agassizi* was the predominant organism. Other species of Ampelisca were obtained throughout the area. *A. vadorum* comprised

most of the benthic population in the New London Site area (ref. 231). Leptocheirus sp., another tube-dwelling amphipod, was also abundant at the New London Site. Both genera, Leptocheirus and Ampelisca, prove to be valuable, since they provide food for commercially important finfish.

6.102 Polychaete worms were often found in association with the gammaridean amphipods. The most abundant types of polychaetes found were non-motile forms which were suspension and detritus feeders. Occasionally, other forms such as Nereis sp. or Nepthys sp. which were raptorial and motile would be obtained. Polychaete worms varied as to abundance and genera, but Clymenella torquata, C. zonalis, Prionospio sp., Lumbrinereis tenuis and Nepthys incisa appear frequently throughout the area.

6.103 Molluscan bivalves are often found in the areas as well, although they are not as abundant as amphipods nor as diverse as polychaete worms. Nucula proxima was found in many areas and Pratt et al. (ref. 177) describes these mollusks as characteristic of soft sediments.

6.104 McCall (ref. 129) described a group of species which were oppurtunists, characterized by rapid development, many reproductions per year, high recruitment and high death rate. Among this group were Streblespio benedicti, Capitella capitata and Ampelisca sp. Therefore, these species are likely to be found recolonizing areas after disturbances have occurred.

6.105 Other faunal assemblages are recognized within the area. Attached forms such as hydrozoans and Balanus balanus were obtained in the vicinity of Dispersal Site 1. Abbott (ref. 1) described bryozoan communities in Block Island Sound. Burrowing organisms, such as the amphipods and polychaetes, were found in sparse quantities in this area. Part of Containment Site 3 on the northern side of Sites A and B have yielded few organisms and low species diversity in past studies. Small rocks and sand were found in grab samples from these areas which may be the reason for the unstable benthic populations.

6.106 The faunal assemblages of Long Island Sound were sampled and analyzed by MACFC (ref. 225). Faunal assemblages were found to be dependent upon the depth of the water column and substrate composition. The most prevalent assemblages were found in silt-clay sediments at 14-40 meters in depth and in coarse sand sediments in both deep and shallow waters.

6.107 Much of the macrofauna in the center of Long Island Sound was obtained in 14-40 meters of water in sediments comprised of over 68% silt and clay. The soft bottom community was characterized by Nepthys incisa and Mulinia lateralis with co-dominance by Pherusa affinis and Melinia cristata. Other macrofauna included Pitar morrhuana, Retusa canaliculata, Yoldia limatula and Ampelisca abdita. Sanders (ref. 185) found bottom communities throughout Long Island Sound to be characterized by Nepthys incisa and Nucula proxima. MACFC (ref. 225) found a similar assemblage during the summer, however, the Mulinia

lateralis continued to prevail over Nucula proxima. It has been suggested by other investigations that the recent dominance by Mulinia lateralis could be the result of environmental fluctuations during the past twenty years.

6.108 The northern shore of Long Island is characterized by sediments of coarse sand in 2-6 meters of water. The faunal assemblage was composed primarily of Nepthys picta, other polychaete worms, Spisula solidissima (surf clams), Crepidula fornicata and the amphipods, Protohaustorius wigleyi and Trichophoxus epistomus. Pratt (ref. 174) also found similar organisms such as Nepthys bucera, N. picta, and Spisula solidissima, among others in sand bottom assemblages. A similar assemblage of macrofauna existed in coarse sands at 20-40 meters. The aforementioned organisms plus Ampharete arctica, Tharyx acutus, Polydora ligni, Nassarius trivittatus and Cancer irroratus were found in deep silt-clay sediments. Along the Connecticut and New York coast grain sizes intermediate to silt-clay and coarse sand sediments were obtained. Organisms from both of these faunal assemblages were obtained within this area.

6.109 Although Sanders (ref. 185), and MACFC (ref. 225), found diverse and numerous organisms in the western portion of Long Island Sound, subtle differences in the assemblages suggested influence from contamination. The predominating organisms from the different assemblages were still found, but increases of spionid, cirratulid and capitellid worms were indicative of heavier contaminent loads.

6.110 Although Mulinia lateralis is considered to be a slightly

opportunistic species, McCall (ref. 129) places Nepthys incisa in a group which he designates as a relatively stable colonizing species. McCall found the first recolonizing, and thus the most opportunistic, species in nearshore communities were Streblospio benedict, Capitella capitata and Ampelisca sp.

6.111 Finfish. The New England River Basins Commission report on Long Island Sound (ref. 152) lists the 61 most common finfish species, of over 100 species known to exist in Long Island Sound. (See Table 6-3) The spawning and migration habits of 16 of these species are presented in Table 6-4. This table shows that tautog and blackback flounder are the only species known to be in the Sound all year, whereas the other species appear in the Sound only during certain seasons of the year.

6.112 For the most part, the other species are summer migrants coming into the Sound some time during May and usually leaving around October before the onset of winter and lower water temperatures.

6.113 Of the 16 species all except bluefish, butterfish, fluke and gray fish sharks appear to spawn in the Long Island Sound region. Butterfish spawning can take place in Rhode Island and Block Island sounds. Bluefish and fluke are believed to spawn in deeper waters off the coast.

6.114 There are two basic seasonal migration patterns. These are: offshore-to-inshore and inshore-to-offshore as in the case of bluefish, butterfish, fluke, swellfish, scup, sea robins, and mackerel; south-

TABLE 6-3 SIXTY-ONE MOST COMMON FISH OF LONG ISLAND SOUND

COMMON AND SCIENTIFIC NAME	RELATIVE ABUNDANCE		RESIDENCY		UTILIZATION		WHERE FOUND: BY WATERS AND BOTTOM.					
	COMMON	LESS-COMMON	PERMANENT	SEASONAL	SPORT	COMMERCIAL & BAIT.	SALINE	BRACK-ISH	FRESH	MUD	SAND	ROCK
ATLANTIC STURGEON ACIPENSER OXYRHYNCHUS.	-	ENDANGRD	X	-	-	-	X	X	X	X	X	-
SHORTNOSE STURGEON ACIPENSER BREVIROSTRUM.	-	PROTECTD	X	-	-	-	X	X	X	X	X	-
GRUBBY MYOXOCEPHALUS AENAEUS.	X	-	X	-	-	-	X	X	-	X	X	-
SHORTHORN SCULPIN MYOXOCEPHALUS SCORPIUS.	-	X	X	-	-	X	X	-	-	-	X	X
LONGHORN SCULPIN MYOXOCEPHALUS OCTODECEMSPINOSUS.	X	-	X	-	-	X	-	X	-	-	X	X
SEA RAVEN HEMITRIPTERUS AMERICANUS.	X	-	X	-	-	X	X	X	-	-	-	X
SUMMER FLOUNDER PARALICHTHYS DENTATUS.	X	-	-	X	X	X	X	X	-	X	X	-
FOURSPOT FLOUNDER PARALICHTHYS OBLONGUS.	-	X	X	-	-	-	X	X	-	-	X	-
WINDOWPANE SCOPHTHALMUS AQUOSUS.	X	-	X	-	-	X	X	X	-	-	X	-
WINTER FLOUNDER PSEUDOPLEURONECTES AMERICANUS.	X	-	X	-	X	X	X	X	-	X	X	-
HOGCHOCKER TRINECTES MACULATUS.	-	X	X	-	-	-	X	X	-	-	-	-
NORTHERN PUFFER SPHOEROIDES MACULATUS.	X	-	X	-	-	X	X	X	X	X	X	X
AMERICAN EEL ANGUILLA ROSTRATA.	X	-	X	-	-	X	X	X	X	X	X	X
BLUEBACK HERRING ALOSA AESTIVALIS.	X	-	-	X	-	X	X	X	X	-	X	X
ALEWIFE ALOSA PSEUDOHARENGUS.	X	-	-	X	X	X	X	X	X	-	-	-
AMERICAN SHAD ALOSA SAPIDISSIMA.	X	-	-	X	X	X	X	X	X	-	X	-
HICKORY SHAD ALOSA MEDIOCRIS.	X	-	-	X	-	-	X	X	-	-	-	-
ATLANTIC HERRING CLUPEA HARENGUS HARENGUS.	-	X	-	X	-	-	-	-	-	-	-	-
ATLANTIC MENHADEN BREVOORTIATYRANNUS.	X	-	-	X	-	X	X	X	-	-	-	-
BAY ANCHOVY ANCHOA MITCHILLI.	X	-	X	-	-	X	X	X	-	-	-	-
BROWN TROUT SALMO TRUTTA.	X	-	X	-	X	-	X	X	X	-	X	-
RAINBOW SMELT OSMERUS MORDAX.	X	-	X	-	X	X	X	X	X	X	X	X
WHITE CATFISH ICTALURUS CATUS.	X	-	X	-	X	X	X	X	X	X	X	-
OYSTER TOADFISH OPSANUS TAU.	X	-	X	-	X	-	X	X	-	X	X	-
ATLANTIC COD GADUS MORHUA.	-	X	-	X	X	-	X	X	-	-	X	X
SILVER HAKE MERLUCCIUS BILINEARIS.	-	X	-	-	X	X	X	X	-	-	X	X
ATLANTIC TOMCOD MICROGADUS TOMCOD.	X	-	X	-	X	X	X	X	X	-	X	-
POLLOCK POLLACHIUS VIRENS.	-	X	-	X	X	-	X	-	-	X	X	X
RED HAKE UROPHYCIS CHUSS.	-	X	-	X	-	-	X	X	-	X	X	-
OCEAN POUT MACROZOARCES AMERICANUS.	-	X	X	-	-	X	X	X	-	-	X	-
SHEEPSHEAD MINNOW CYPRINODON VARIEGATUS.	X	-	X	-	-	-	X	X	-	-	-	-
BANDED KILLIFISH FUNDULUS DIAPHANUS.	X	-	X	-	-	-	X	X	X	X	-	-
MUMMICHOG FUNDULUS HETEROCLITUS.	X	-	X	-	X	X	X	X	-	X	-	-
STRIPED KILLIFISH FUNDULUS MAJALIS.	X	-	X	-	-	-	X	-	-	-	X	-
TIDEWATER SILVERSIDE MENIDIA BERYLLINA.	X	-	X	-	-	-	X	X	-	-	-	-
ATLANTIC SILVERSIDE MENIDIA MENIDIA.	X	-	X	-	X	X	X	X	-	X	-	-
NORTHERN PIPEFISH SYNGNATHUS FUSCUS.	X	-	X	-	X	X	X	X	-	X	-	-
WHITE PERCH MORONE AMERICANA.	X	-	X	-	X	X	-	X	X	X	X	-
STRIPED BASS MORONE SAXATILIS.	X	-	-	X	X	X	X	X	X	X	X	X
BLACK SEA BASS CENTROPRISTIS STRIATA.	-	X	-	X	X	X	X	X	-	-	-	X
BLUEFISH POMATOMUS SALTATRIX.	X	-	-	X	X	X	X	-	-	-	-	-
SCUP STENOTOMUS CHRYSOPS.	X	-	-	X	X	X	X	X	-	-	-	X
WEAKFISH CYNOSCION REGALIS.	X	-	-	X	X	X	X	X	-	-	X	-
SPOT LEIOSTOMUS XANTHURUS.	-	X	-	X	X	-	-	X	-	-	X	-
NORTHERN KINGFISH MENTICIRRHUS SAXATILIS.	-	X	-	-	X	-	X	X	-	-	X	-
TAUTOG TAUTOGA ONITIS.	X	-	X	-	X	X	X	X	-	-	-	X
CUNNER TAUTOGOLABRUS ADSPERSUS.	X	-	X	-	X	-	X	X	-	-	-	X
AMERICAN SAND LAUNCE AMMODYTES AMERICANUS.	X	-	X	-	X	X	X	X	-	-	X	-
ATLANTIC MACKEREL SCOMBER SCOMBRUS	X	-	-	X	X	X	X	-	-	-	-	-
BUTTERFISH PEPRILUS TRIACANTHUS.	X	-	X	-	X	X	X	X	-	-	X	-
NORTHERN SEA ROBIN PRIONOTUS CAROLINUS.	X	-	-	X	-	X	X	X	-	-	X	-
STRIPED SEA ROBIN PRIONOTUS EVOLANS.	X	-	-	X	-	X	X	-	-	X	X	X
SANDTIGER ODONTASPIS TAURUS.	X	-	-	X	-	X	X	-	-	X	X	X
SANDBAR SHARK CACHARHINAS MILBERTI.	X	-	X	-	-	X	X	-	-	-	X	-
SMOOTH DOGFISH MUSTELUS CANIS.	X	-	-	X	-	X	X	X	X	X	X	-
SPINY DOGFISH SQUALUS ACANTHIAS.	X	-	-	X	-	X	X	-	-	-	X	-
LITTLE SKATE RAJA ERINACEA.	X	-	-	X	-	X	X	X	-	X	X	X
BIG SKATE RAJA BINOCULATA.	X	-	-	X	-	X	X	X	-	X	X	-
CLEARNOSE SKATE RAJA EGLANTERIA.	X	-	-	X	-	X	X	X	-	-	X	-
BARNDOOR SKATE RAJA LAEVIS.	-	X	X	-	-	X	X	X	-	X	X	-
ROUGHTAIL STINGRAY DASYATIS CENTROURA.	-	X	-	X	-	X	X	-	-	X	X	-

TABLE 6-4

Finfish Spawning and Migrations

Into Long Island Sound

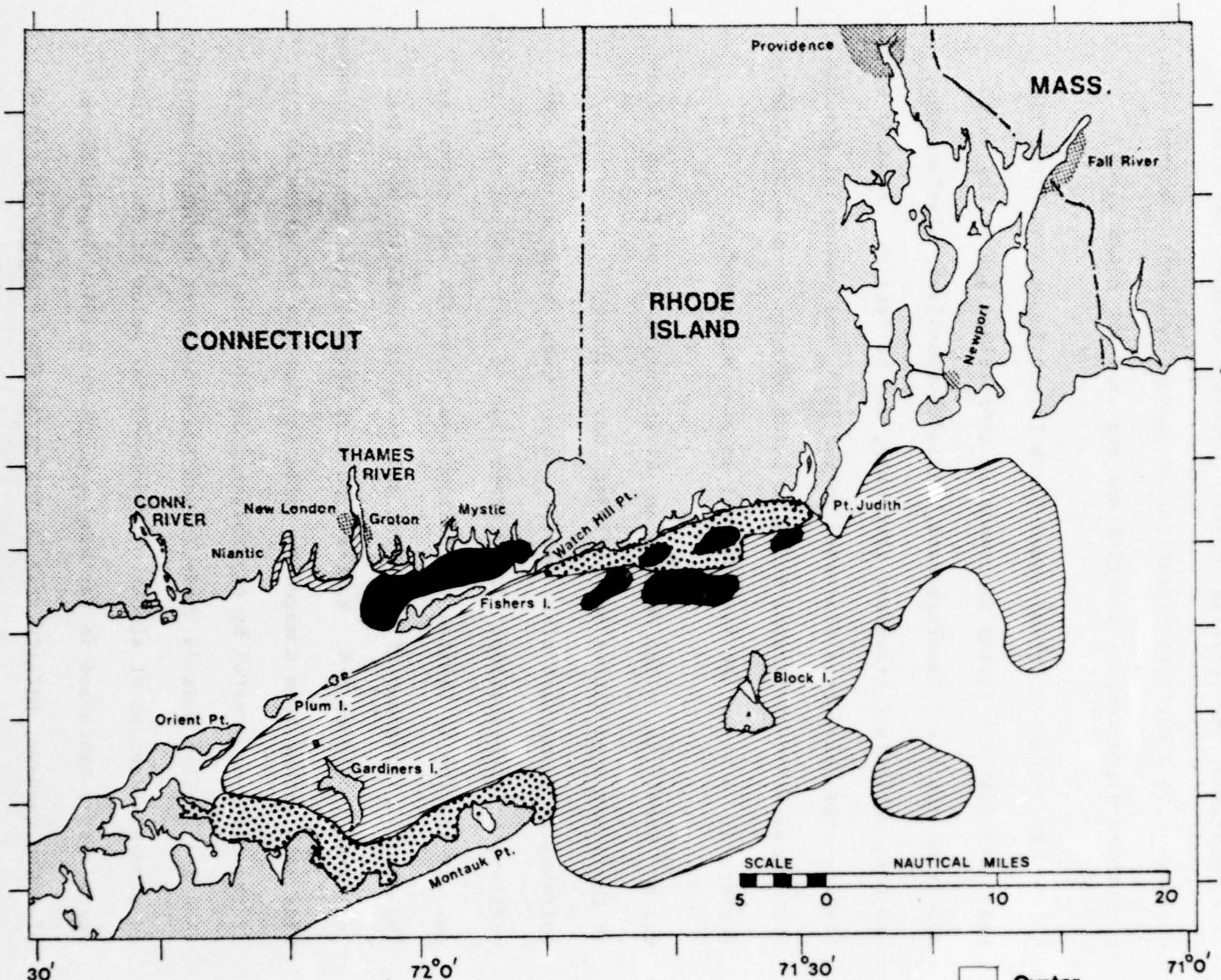
s	Inside Sound	Outside Sound	Spawning Period	Type of Eggs	Time of Year Found in Sound
uefish		X	April-July	pelagic	May-October
Butterfish		X	June-August	pelagic	May-October
Blackback Flounder	X		January-May	demersal	All year
Fluke		X	November-April	pelagic	May-October
Mackerel	X		May-June	pelagic	May-October
Menhaden	X		June-August	pelagic	May-October
Scup or Porgy	X		May-August	pelagic	May-October
Sea Bass	X		May-June	Pelagic	May-October
Sea Trout or Weakfish	X		May-October	Pelagic	May-October
Grayfish Shark*					May-November
Striped Bass	X		April-May	pelagic	May-October (Possibly all ye
Swellfish or Puffer	X		May-August	demersal	May-October
Tautog	X		May-August	pelagic	All year
Sturgeon	X		May-July	pelagic	May-October (Possibly all ye
Kingfish	X		June-August	pelagic	May-October
Sea Robin	X		June-September	pelagic	May-October

*Grayfish sharks are viviparous.

to-north in summer and north-to-south in winter as exhibited by striped bass, menhaden, and grayfish sharks. Offshore movement may also be combined with a southern migration, or inshore movement combined with a northern migration, as weakfish and sea bass are known to do.

6.115 In the Rhode Island Sound-Block Island Sound area (Area 539, ref. 234) fish not listed as common in Long Island Sound, but which appear on catch and landings data, include: swordfish, bluefin tuna, haddock, yellowtail flounder, grey sole, and butterfish. Favored sport fishing areas have been discussed in the FEIS, and commercial grounds are discussed in paragraphs 6.155 to 6.160 of this supplement. The commercial value of the finfisheries is also discussed.

6.116 Shellfish. The density and distribution of shellfish stocks in the study area varies but includes: bay quahaug, ocean quahaug, softshelled clam, surf clam, oyster, conch, moon snail, mussel, bay scallop, and sea scallop. The distribution of soft-shelled clam, oyster, and bay scallop is limited to shallow bays, channels, and estuaries. The general locations of nearshore and offshore shellfish beds are indicated in Figure 6-8. Many of the soft shelled clam and bay quahaug beds have either been damaged by pollution, or may be harvested only if the catch is treated by depuration prior to sale. Overfishing of some sea scallop beds in Rhode Island Sound has been reported resulting in a severe decline of stocks. The commercial value of the shellfish resources is discussed in paragraphs 6.166 to 6.169. Reproduction of ocean quahaug, particularly in the areas that are heavily fished,



SHELLFISH BEDS

Oyster
Surf Clam
Bay-Ocean Quahaugs
Bay-Sea Scallops

FIG.6-8

appears good, with seed and juveniles plentiful.

6.117 In Long Island Sound, ocean quahaug is not harvested. The Niantic bay scallop resource is limited to the Niantic River. Harvested oyster beds are located in the Connecticut River, Long Sand Shoal and a few areas adjacent to the mouth of the river (Figure 6-8). Some bay quahaugs are found in Niantic Bay and the southwestern end of New London Harbor. The locations of other shellfish beds have been indicated in the RDEIS (ref. 248).

6.118 Lobsters and Crabs. Various species of these crustaceans inhabit the Sounds and include: lobster, blue crab, rock crab (cancer crab and Jonah crab), spider crab, and horseshoe crab. The latter two species are not commercially important, but contribute to the diversity and stability of the ecosystem. Commercial aspects of other species are discussed in paragraphs 6.152 to 6.156.

6.119 The Human Environment - Federal Jurisdiction and Legal Structures. Federal laws and jurisidiction govern the disposal of dredge spoils in navigable waters and offshore coastal waters. Specifically, the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (EPA) share responsibility for these activities. A full discussion of these regulations, as pertains to navigable waters, is found in Section 4. Regulations concerning ocean waters are summarized below.

6.120 Section 403 of The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500; 86 Stat. 816) or FWPCA, authorizes the U.S.

Environmental Protection Agency (EPA) to publish guidelines to govern disposal of wastes "into the territorial sea, the waters of the contiguous zone, or the oceans." The area of this jurisdiction is referred to as "Ocean Waters" herein and includes all waters offshore of the baseline from which the territorial sea is measured. Regulations published pursuant to Section 403 of FWPCA are discussed below.

6.121 Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532; 86 Stat. 1052) regulates the transportation of dredged material for the purpose of dumping it into ocean waters. While the U.S. Army Corps of Engineers administers the requirements of Section 103, it does so through application of criteria established by the EPA. Section 102 of the Act states that these EPA criteria must be at least as stringent as those binding on the United States under the 1972 Convention on the Prevention of Marine Pollution By Dumping of Wastes and Other Matter. EPA regulations on ocean dumping (40 CFR 220-227) described below, were enacted in response to requirements of the Convention. The Act further states that the criteria are to be founded in broad-based considerations including, but not limited to:

- The need for the proposed dumping;
- The effect of dumping on human health and welfare, including economic, esthetic and recreational values;
- The effect of dumping on fisheries resources, plankton, fish, shellfish, wildlife, shorelines and beaches;

- The effect of dumping on marine ecosystems;
- The persistence of the effects of dumping;
- The effect of dumping particular volumes and concentrations of materials;
- Appropriate locations and methods of disposal;
- The effect of dumping on alternate uses of oceans.

6.122 As is the case under FWPCA, the EPA can prohibit dumping if unacceptable adverse effects will occur to:

- Municipal water supplies;
- Shellfish beds, wildlife, fisheries (including spawning and breeding areas);
- Recreational areas.

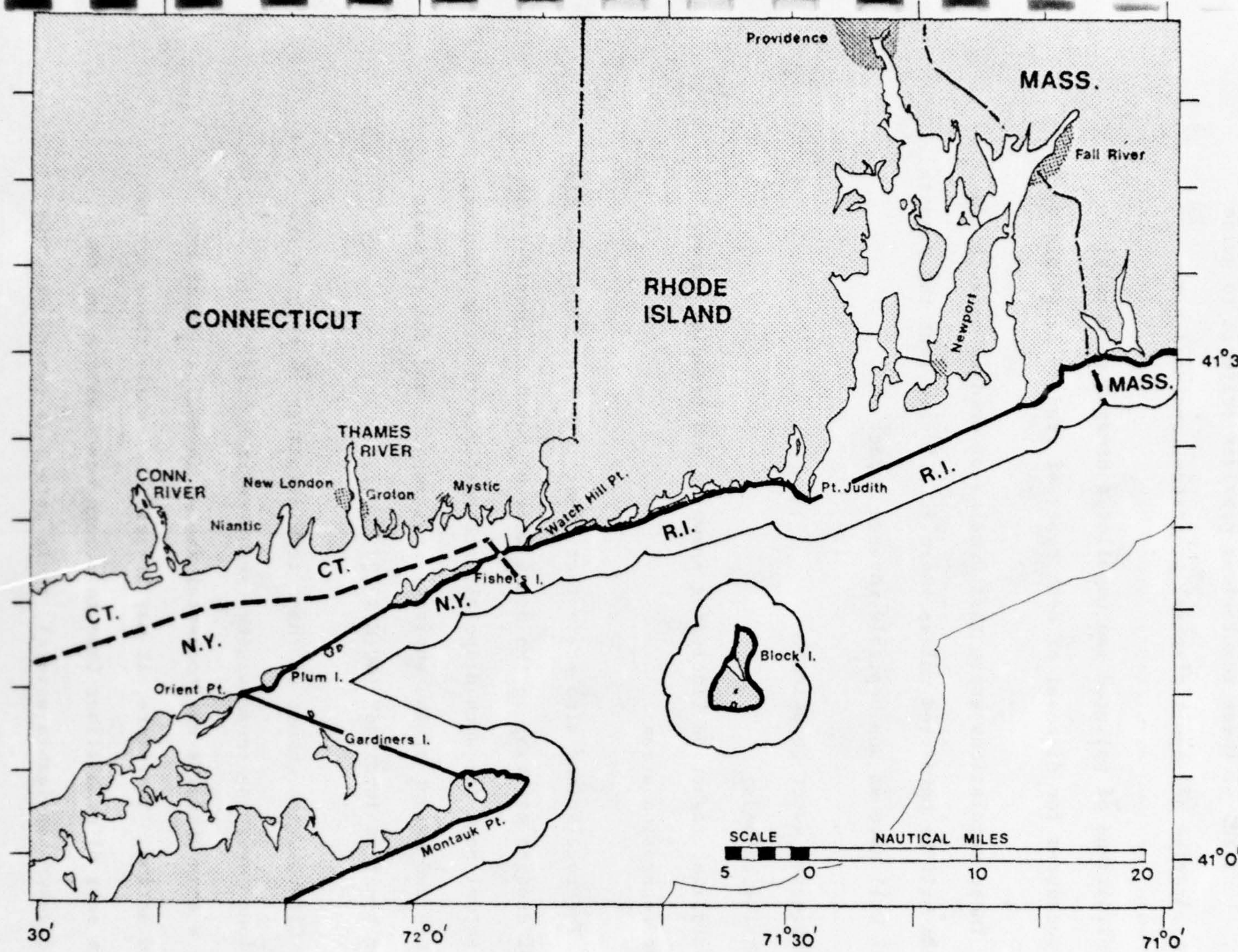
6.123 The Act also authorizes the Secretary of Commerce, in consultation with the States, to establish Marine Sanctuaries in waters on the Continental Shelf. Once such sanctuaries are established, any activities occuring in them must conform to regulations issued by the Secretary.

6.124 As described in paragraph 4.08, the Corps of Engineers recently published regulations (33 CFR 209.120; F.R. July 25, 1975) which established procedures by which it will administer dredging and spoil disposal permits. These regulations provide an extensive list of considerations to be addressed by the District Engineer in his deliberations on a permit request.

6.125 While the Corps of Engineers administers the permit application process, regulations published by the EPA are to be used by the Corps to supplement its own regulations in the review process. In certain instances the EPA administrator has veto power over Corps of Engineers' decisions. See paragraph 4.11. Two sets of EPA regulations are relevant, one concerning Navigable Waters and another concerning Ocean Waters. A discussion of regulations recently published by the EPA (40 CFR 230; F.R., September 5, 1975) for use by the Corps of Engineers in reviewing permit applications for disposal of dredged materials into navigable waters has been presented in paragraph 4.10.

6.126 A separate set of EPA regulations (40 CFR 220-227; F.R. October 15, 1973) will be used by the Corps of Engineers in reviewing permit applications for transportation of dredged materials in order to dump them into ocean waters. For the purpose of these regulations "ocean waters" are defined as all waters seaward of the baseline from which the territorial sea is measured. Figure 6-9 shows the location of the baseline. National jurisdiction extends seaward to twelve miles from the baseline. The area lying between the three mile territorial sea and the twelve mile limit is called the contiguous zone. Beyond this lie international waters.

6.127 These regulations are published in response to requirements of the <u>1972 Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter</u>, Section 403 of FWPCA (P.L. 92-500), and Title I of the <u>Marine Protection, Research and Sanctuaries Act</u> (P.L.



OFFSHORE JURISDICTION

FIG.6-9

92-532). Part 227 of these regulations provides criteria to guide the permit review and spoil disposal processes. Included are:

- Definitions of polluted and unpolluted dredged materials;
- Procedures for disposal of both types of dredged materials.

6.128 These regulations state that dumping of dredged material in the ocean will be permitted unless there is evidence that the proposed disposal will have an unacceptable adverse impact on:

- Municipal water supplies;
- Shellfish beds;
- Wildlife, fisheries (including spawning and breeding areas), or recreation areas.

6.129 The regulations also state that "Decisions concerning the disposal of dredged material in the ocean will be based on considerations of the actual need for such disposal, alternatives to ocean dumping, the nature and extent of the environmental impact, and the economic costs or benefits involved" (40 CFR 227.6(d)).

6.130 Clearly, the thrust of these regulations as is that of the regulations governing ocean waters (see paragraph 4.10) is to require a comprehensive environmental impact investigation of any proposed action. Therefore, it may be said that while there are two separate sets of regulations (one to govern ocean waters and the other to govern navigable waters), their intent is essentially the same.

6.131 It should be noted that in November 1975, the National Wildlife Federation filed suit against the U.S. Army Corps of Engineers and others challenging the ocean dumping criteria with regard to their regulating the dumping of dredged material. "According to reports, the plaintiff claims that the criteria violate areas of consideration specified in the Act, and that they apply less restrictive evaluation factors to the review of dredged material dumping than to other ocean dumped wastes. The plaintiff also claims that the criteria violate the provisions of the international 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, effective August 30, 1975, by failing to prohibit the dumping of material containing mercury and cadmium. (Private communication from New England Division, U.S. Army Corps of Engineers, dated March 17, 1976).

6.132 In selecting ocean sites for disposal of dredged materials, the Corps of Engineers is charged by the regulations to select, to the maximum extent possible, sites previously designated for such use. As with the regulations pertaining to navigable waters described previously, 40 CFR 230, the EPA has authority under 40 CFR 227 to review and approve or disapprove any permits issued by the Corps of Engineers for ocean disposal.

6.133 One of the proposed disposal sites, the "Munitions Site", lies beyond the 12-mile limit. Regulations governing its use will be the same as those governing disposal sites in ocean waters within the 12 mile limit since these regulations were enacted in part to

fulfill U.S. obligations under the <u>1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter</u>.

6.134 State Jurisdictions. While Federal statutes and regulations govern the offshore disposal of spoils, it is Federal practice to examine State and local resource policies in areas to be affected by proposed actions. When feasible, such policies will be respected in the Federal permit granting process.

6.135 State jurisidiction extends offshore to the outer edge of the territorial sea. In the case of Long Island Sound, a special boundary has been established to delimit the New York-Connecticut border. The State borders and the limits of the territorial sea are shown on Figure 6-9.

6.136 None of the three States whose waters are involved in the proposed action has established marine sanctuaries which would require protection under the Marine Protection, Research, and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1052). Of the three States, only Rhode Island has prepared a Coastal Zone Management Plan Document. Entitled "Coastal Resource Management Council Plan - Policies and Regulations", this document recognizes the potential dangers in offshore spoil disposal and requires a permit for non-Federal projects. No further guidance is offered regarding offshore disposal. While the other States are preparing Coastal Zone Management Plans, these plans are not yet refined enough to give substantive guidance to proposed spoiling operations in State waters.

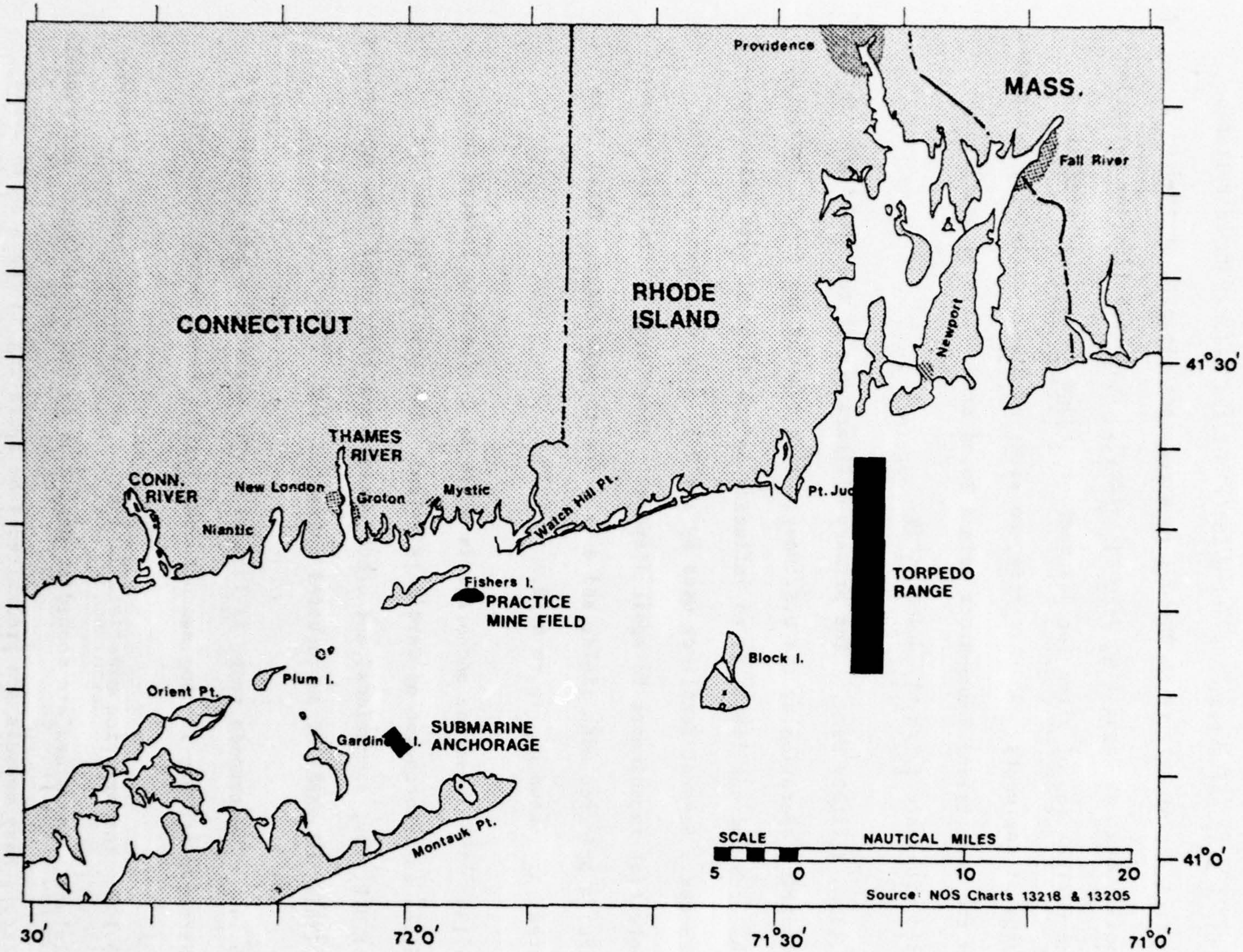
6.137 Disposal Sites. Section 404(a) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) requires that disposal of dredge spoils occur at "specified disposal sites". Responsibility for selection and designation of sites for disposal of dredge spoils lies with the Corps of Engineers. At this time, no sites have been officially designated in the Long Island Sound-Block Island Sound area. Several previously used sites are currently under study.

6.138 Military Uses. The primary military use of the study area is submarine operation by the U.S. Navy. This type of use occurs throughout the area and has little or no influence on the disposal site selection process. Several auxiliary uses by the U.S. Navy do, however, offer potential impediments to spoil disposal. These are: a submarine anchorage; a practice mine field; and a practice torpedo range. These three areas are shown on Figure 6-10.

6.139 The submarine anchorage is a 3/4 by 2-mile area located three miles east-northeast of Gardiners Island. The area is for the use of U.S. Navy submarines, and other vessels are restricted from approaching within 500 yards of an anchored submarine (ref. 237).

6.140 The torpedo range is located in the separation zone between the Narragansett Bay Inbound and Outbound Traffic Lanes (NOAA Chart 13218).

6.141 The practice minefield is located two miles southeast of Fishers Island. The mines are moored at depths in excess of 40 feet. All vessels except Navy vessels are prohibited from operating in the area to avoid



MILITARY USES

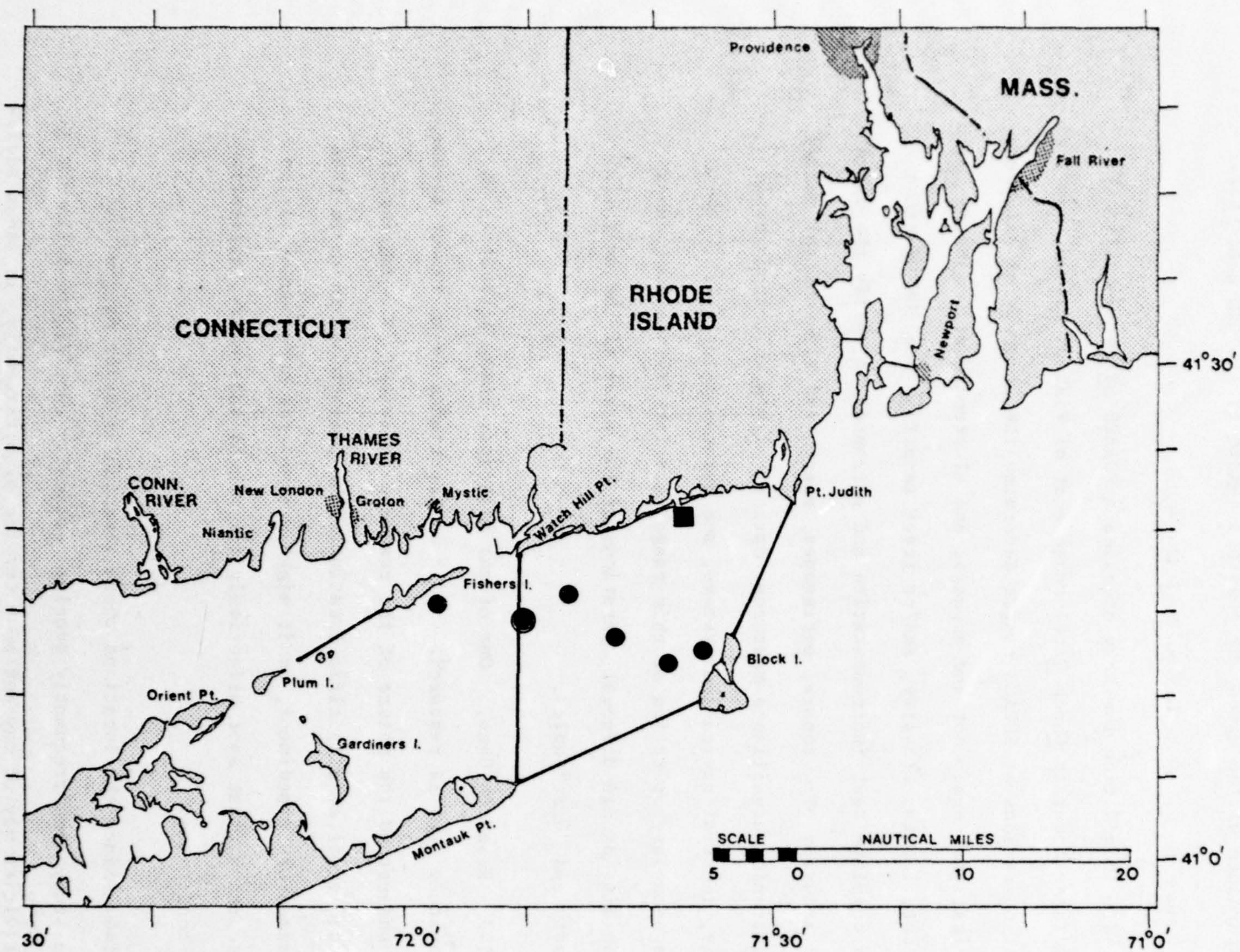
FIG. 6-10

disturbance of the mines and possible damage to fishing gear (ref. 237).

6.142 In addition the Navy operates a FORACS (Fleet Operational Readiness Accuracy Check Site) range east of Fishers Island, New York. Test operations at FORACS ranges determine the accuracy of shipboard navigational equipment and acoustic and electromagnetic sensors which detect, locate, classify, and/or track targets. The FORACS range has complete test instrumentation and personnel to verify the operability and accuracy of: sonars, periscopes, search and fire control radars, electronic surveillance measures, optical sights, electromagnetic logs, inertial navigation systems, and gyrocompasses," (ref. 246). The necessary operation of this range restricts and in some cases prohibits dredge disposal operations in the areas of the so called "East" and "West" holes.

6.143 Research Uses. One of the principal human activities in the study area is research. It is of importance in an impact assessment to understand the nature of the research activity. The dumping of dredge spoil at a specific location might present nothing more than a temporary impediment, or it might prevent the continuance of the research at that spot effectively forever by substantive alteration of conditions.

6.144 Since the locations where research is being carried out in the study area frequently overlap physically (See Figure 6-11) and the activities may or may not be occurring simultaneously, it seems advis-



RESEARCH SITES

— N.Y. Ocean Science Lab.
● BIFI Acoustic Range Station
○ East Hole
■ Charlestown, R.I., Monitoring

FIG. 6-11

able to consider the research on the basis of the agency which is responsible for it. The bulk of the work is under the auspices of one of the following; an agency of the Federal government, the State government (either through one of its agencies or through its university system), and private universities. There is a limited amount of work being done by private corporations in support of applications for government-required permits and by private non-profit groups.

6.145 The Federal government is directly involved in research in the study area in, at least, three ways. The Naval Underwater Systems Center has established an acoustic range between Fishers Island and Block Island (the BIFI Range). Included as permanent features of the range are at least three buoys and a tower located at the western edge of Block Island. While activity is not currently going on in the range, it has occurred there with considerable frequency since 1969, and it is reasonable to assume that the range might well be used again. The nature of the studies is such that barge activity in the range, sediment in the water column, or alteration of the bottom configuration might either separately or collectively hinder the research. The University of Connecticut through its Marine Sciences Institute (Avery Point) and its Marine Research Laboratory (Noank) has been an active participant in these studies.

6.146 The same branches of the University of Connecticut are also involved with the National Oceanic and Atmospheric Administration in ongoing research on physical and biological conditions at the socalled "East Hole".

6.147 The National Marine Fisheries Service is conducting catch monitoring in the study area. Spoil dumping would not be expected to have a direct impact on this work but would have to be considered in the analysis of the data gathered. Under its own auspices the University of Connecticut is conducting lobster tagging studies and geologic investigations within the study area. Certainly either or both activities could be significantly affected by the dumping of dredge spoil.

6.148 Block Island Sound is the site of shellfish studies being conducted by the University of Rhode Island, and these would also be vulnerable to conflicting dredge spoil dumping.

6.149 Portions of the study area are used by Yale University for the testing of newly developed equipment. Dredge spoil dumping at a known location and in a given time frame would not be expected to present any substantive detriment to this testing activity.

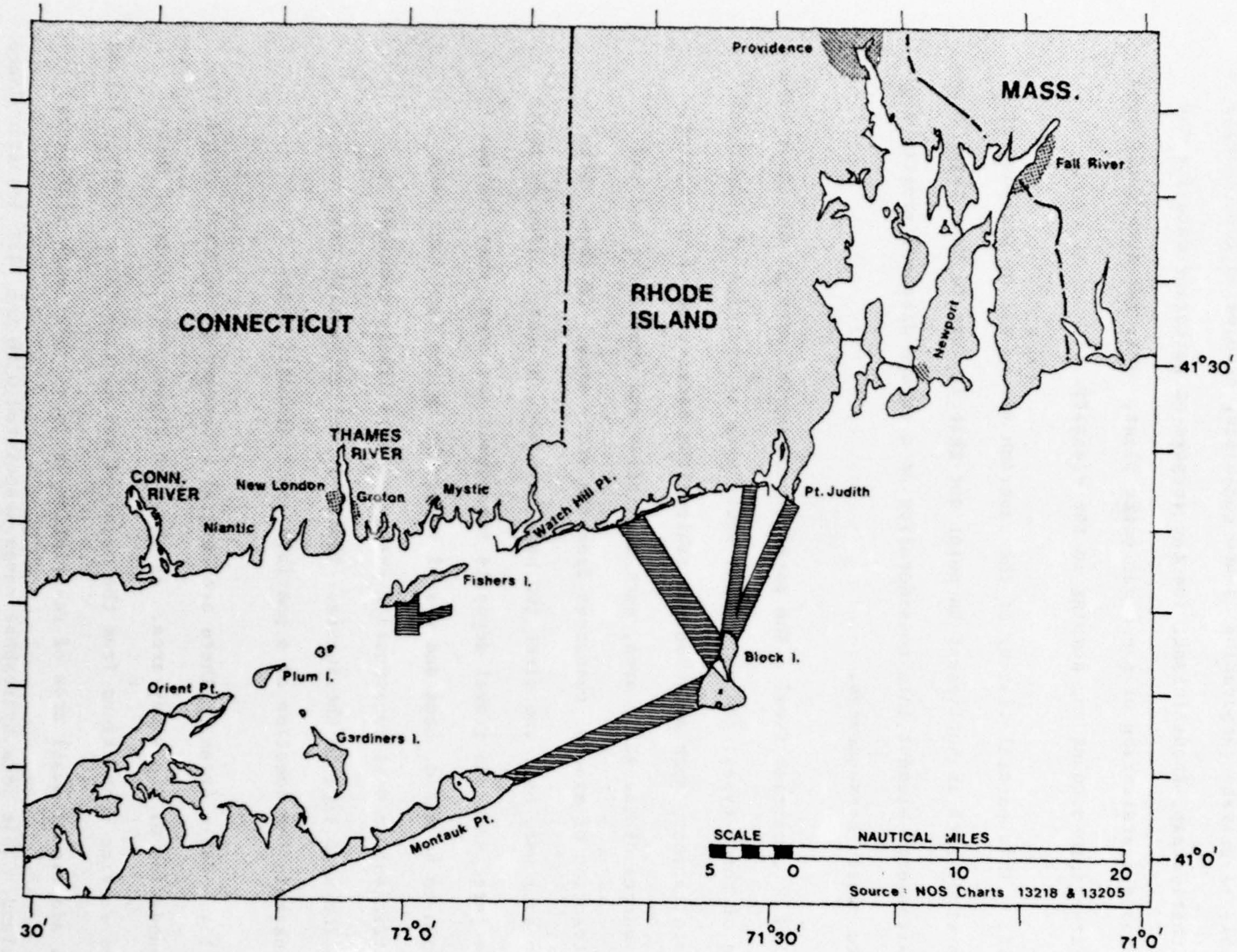
6.150 The New York Ocean Science Laboratory, a non-profit organization, is conducting ongoing investigations along transects which cover a large portion of the study area. The more notable of these transects are between Montauk Point and Block Island, Montauk Point and Watch Hill Point, Block Island and Point Judith, and across the Race. Once again the disposal of dredge spoil along any one of these transects would probably not prove to be an insurmountable obstacle to the continuation of the program but would have to be considered as a new and significant factor in the future use of the affected stations.

6.151 A private corporation is now conducting studies in the vicinity of Charlestown, Rhode Island, for the purpose of gathering data for the proposed installation of a nuclear power plant. This research would have to take into account any dumping in the vicinity.

6.152 This partial listing of the reserach use of all or portions of the study area is sufficient to point out that failure to take this "human environment" element into consideration in a dredge disposal program could have costly consequences.

6.153 Commercial Uses. The possible commercial uses of the study area are of three types: the use of the study area as the site of commercial installations, such as submerged cables; the harvesting of the biologic resources of the study area, such as finfish and shellfish; and the extraction of mineral resources from the study area. Of these three types of use, only the first two have been encountered. Although there are large sand and gravel deposits throughout the area, they are not known to be mined. Sand and gravel resources on the land have been sufficient to meet construction needs and will likely continue to be for some time in the future. Thus, mineral extraction does not constrain the location of a possible spoil disposal site.

6.154 Cable Areas. There are several submerged cable areas within the boundaries of the study area. As shown on Figure 6-12, most of these are service connections from the mainland and Montauk Point to Block Island. An additional small area of restriction is found just south of Fishers Island. This is a hydrophone range associated with the BIFI Acoustic Range



CABLE AREAS

FIG. 6–12

(see paragraph 6.142) and a nearby Navy practice minefield (see paragraph 6.141). All of these areas are unsuitable for spoiling because of the danger of cable burial or breakage. Only if no suitable alternate site could be found, would the prohibitively large expense of moving one of these cables to allow spoiling be acceptable.

6.155 Finfishing. Since writing of the FEIS, additional information has been published on the extent, location, and yield of the fishery in the study area. The National Marine Fishery Service (ref. 234) reports the annual hail for NMFS Statistical Area 539 (Block Island Sound, Rhode Island Sound, Narragansett Bay) to be 72,306,600 pounds during the period 1965-1974. As reported by Olsen and Stevenson (ref. 160), Rhode Island landings for Area 539 during 1973 are reported to be 86,848,000 pounds of fish (foodfish, menhaden, industrial groundfish) with a value of $8,508,000. The species composition of the landings are presented in Table 6-5. There were also landings in New York and Connecticut ports, but data on these are not readily available because of the format of the reporting statistics.

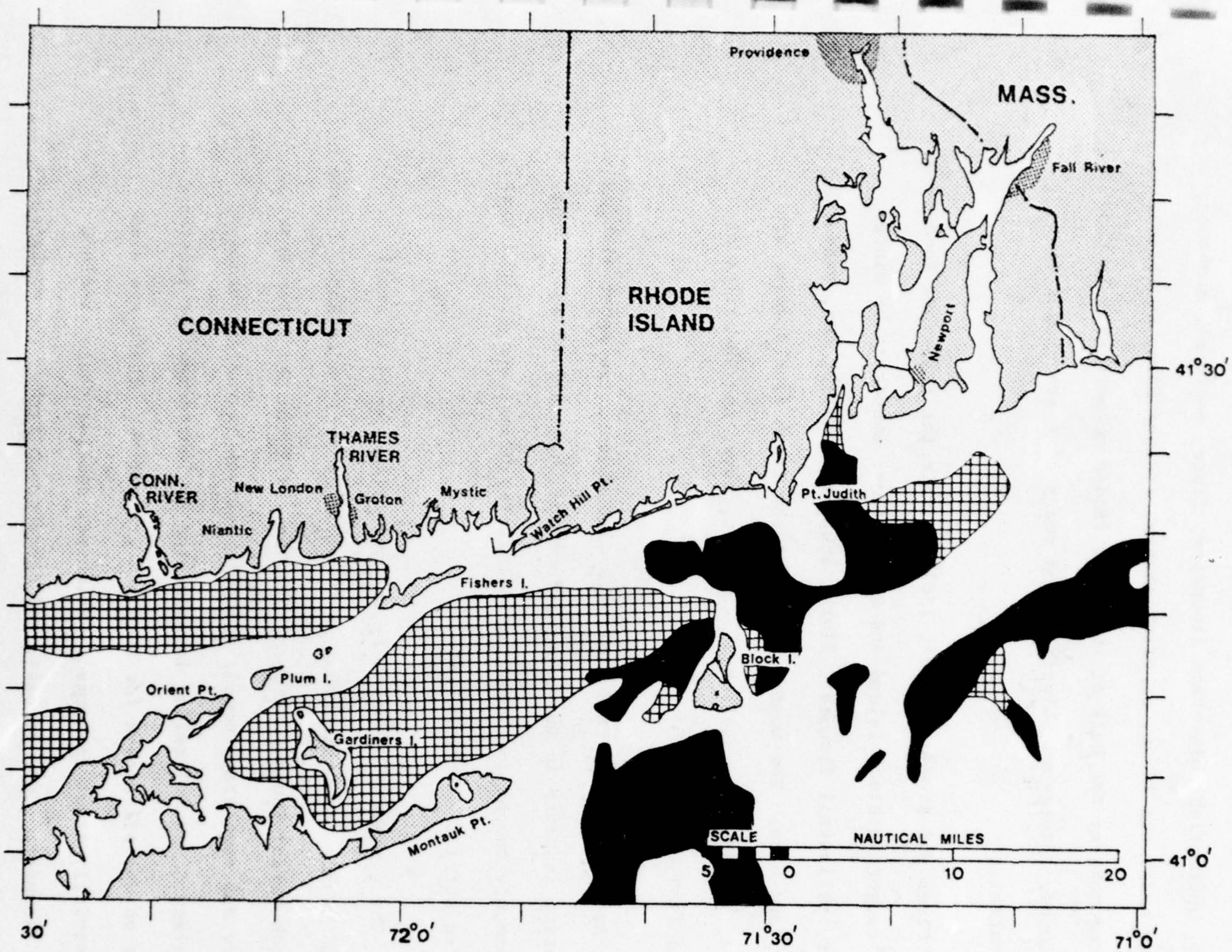
6.156 The catch of the commercial fishery is dependant on the seasonal migration of the various species. While the entirety of the study area is fished, there are grounds which are more heavily trawled than others, as indicated in Figure 6-13. The records of commercial finfish landings at Long Island fishing ports compiled by the National Marine Fisheries Service are the main source of information on the status of finfish populations in Long Island Sound Waters. According to these statistics,

TABLE 6-5

1973 landings of principal species*

	% total lbs.	% total $
Yellowtail	19.5	24.4
Menhaden	16.5	2.1
Herring, sea	9.6	1.6
Blackback	4.5	6.0
Scup	3.4	5.7
Whiting	3.2	2.1
Cod	3.1	3.3
Other food fish (including squid)	10.6	14.9
Mixed industrial	24.9	2.3
Lobster	2.7	34.6
Shellfish (meats)	2.0	3.0

*From Olsen & Stevenson (ref. 160)



FIN FISH TRAWLING AREAS

FIG. 6-13

bluefish, butterfish, blackback flounders, fluke, mackerel, menhaden, scup, sea bass, sea trout, grayfish sharks, striped bass, swellfish, and tautog make up the bulk of the catch landed commercially in Long Island Sound. Sturgeons, kingfish, and sea robins are caught to a lesser extent.

6.157 Olsen and Stevenson (ref. 160) indicate the principal food fish species caught in Block Island and Rhode Island Sounds to be winter flounder, yellowtail flounder, fluke, scup, butterfish, cod, haddock, whiting, and hake. The most numerous of the trash fish species are sculpins, searobins, goosefish, ocean pout, rays, and juveniles of the food fish species.

6.158 As noted in the FEIS, there is also a lucrative sport fishing and boating industry in the Block Island and Rhode Island Sound area. Fish commonly caught for sport include flats, blues, and striped bass. Tuna also attract a large fleet.

6.159 The commercial finfishery in Long Island Sound is small (650,000 pounds for Connecticut in 1970) in comparison to Rhode Island and Block Island Sounds. At present there is a limited otter trawl industry and some trap, pound, and gill netting in various areas of Long Island Sound. Trawling is conducted by lobstermen for lobster bait or on the off season for food and groundfish. There are also a few strictly trawl fishermen. Principal species caught include winter flounder, scup, seabass, and other groundfish. The menhaden and shad fisheries are increasing in commercial importance.

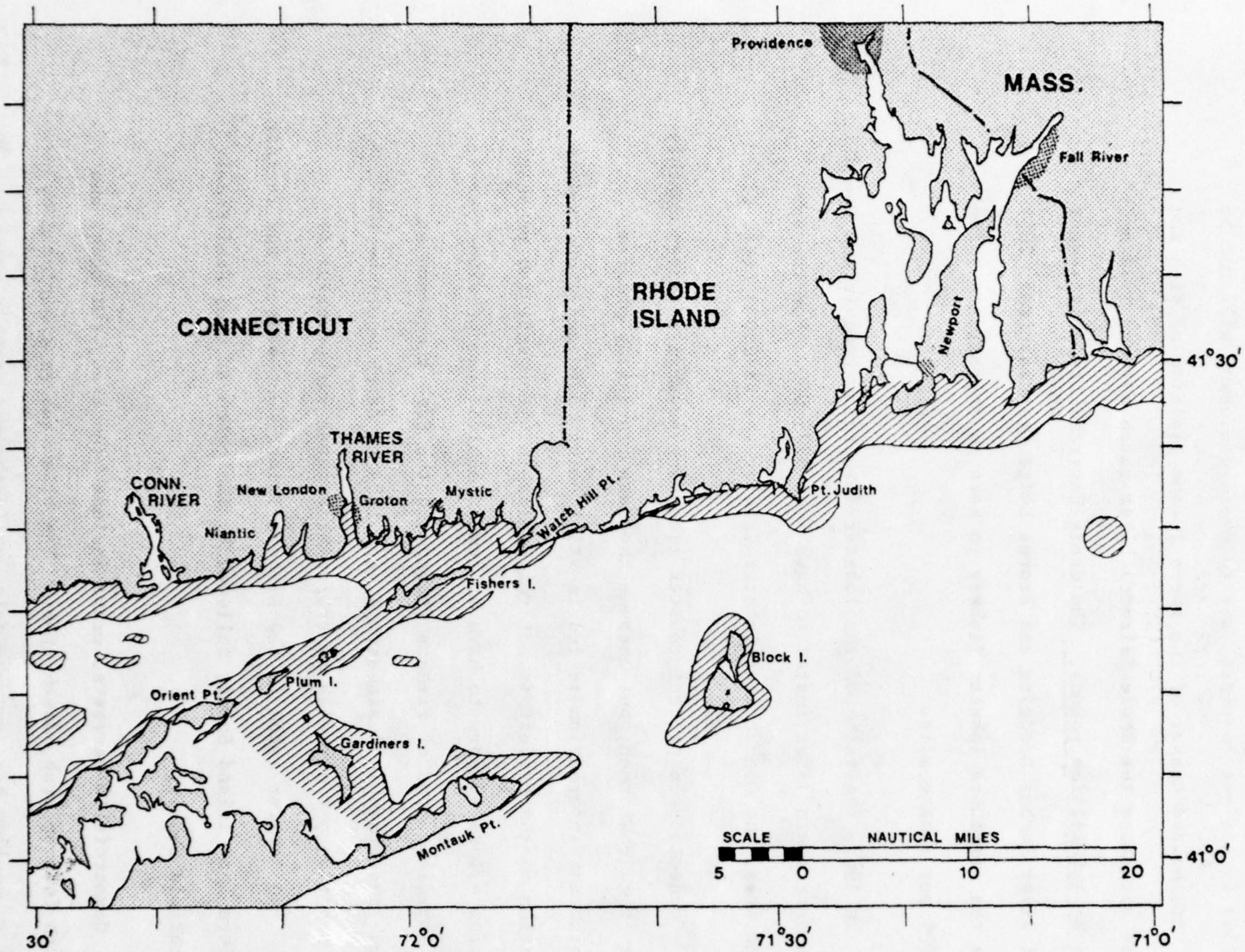
6.160 The greatest commercial value of Long Island Sound lies in its use for sport, be it boating, sport fishing, or leisure. A very conservative estimate of the value is $10 million annually. The value of the commercial finfish landings for Long Island Sound, however, is from $2 to $3 million annually (ref. 153). An updated yield or value of the Connecticut fishery is not yet available due to the structure of a new licensing program for this State (Jones, personal communications). The commercial landings in New York for 1974 are summarized in Table 6-6. Landings, however, do not necessarily mean the fish were caught in Long Island Sound.

6.161 Lobster and Crab Fisheries. Recent interviews with lobstermen and spokesmen for cooperatives regarding the distribution and abundance of stocks did not disclose any information different from that reported in the RDEIS. Major lobstering areas in eastern Long Island Sound, Block Island Sound, and Rhode Island Sound are indicated in Figure 6-14.

6.162 Due to the structure and complexity of catch statistics, it is almost impossible to break out commercial values for lobster in the study area. Additionally, there is inconsistent information on the landings of lobster stocks in NMFS Statistical Area 539 (Block Island Sound, Rhode Island Sound, Narragansett Bay). Olsen and Stevenson (ref. 160) report the 1973 Rhode Island lobster landing value to be $4,018,000. However, most of the catch originated in offshore and continental shelf regions (Olsen, personal communication). The data summary by NMFS New England Fishery Interviews 1965-1974

TABLE 6-6: New York Landings - Annual Summary 1974 (National Marine Fisheries Service, 1975)

County	Finfish	Lobster	Shellfish (meats)
New York			
Hail	$78,725	-	$208,000
Value	21,846	-	311,225
Kings			
Hail	2,258,952	63,000	200,860
Value	544,763	124,205	39,198
Nassau			
Hail	1,926,764	98,531	4,948,712
Value	412,001	188,854	2,010,581
Suffolk			
Hail	13,493,768	568,983	10,666,343
Value	3,211,400	1,082,808	17,204,545



NEARSHORE LOBSTER FISHING AREAS

FIG. 6-14

(ref. 234) is not yet complete, and to avoid confusion will not be cited. Mr. Howard Russel of the Rhode Island Division of Fish and Wildlife estimates the Rhode Island lobster catch between 1968 and 1974 to be 1.5 million pounds. The draft Environmental Assessment of Fall River Harbor Dredging and Browns Ledge Disposal (ref. 205) reports the nearshore lobster fishery to have an approximate value of $2,000 per square mile.

6.163 In 1969, the value of the lobster fishery in Long Island Sound for New York state is estimated to have been $275,000. For the same year and area, the Connecticut lobster landing was $830,000 (ref. 152).

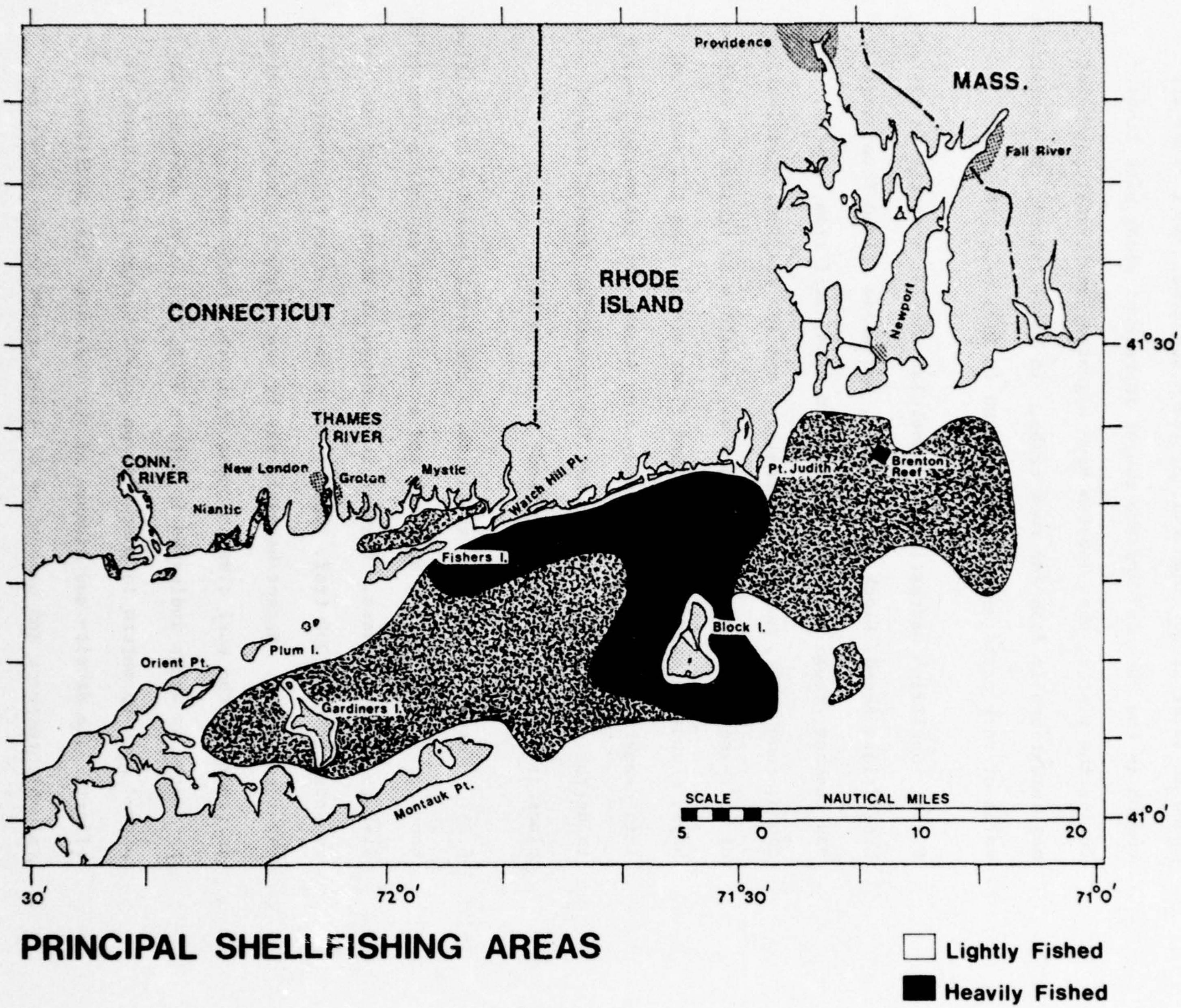
6.164 Connecticut's present lobster licensing program requires monthly reports from lobstermen; but because the data processing program into which the information is fed is still being "debugged", up-to-date information on the harvest is not yet available. However, the present lobstering effort appears to have at least doubled from previous years. In the immediate area of Fishers Island and the Race there are at least 20 lobstermen in business. A good lobster catch would be 100 pounds per tide per man with an approximate total market value of $4,000. The lobster catch in the Fishers Island-Race area is the largest in eastern Long Island Sound, followed by the catch at Long Sand Shoals and Cornfield Shoals.

6.165 Commercially harvested crabs include blue crab, red crab, and rock crab (cancer crab, Jonah crab). The blue crab is restricted by habitat to shallow bays and channels, while the red crab is generally

found in water deeper than that of the study area. Rock crabs are common in the "Sounds" and are caught in catches along with lobster. During the winter, when lobster have migrated, small-scale operators may intentionally fish for rock crabs. In Rhode Island, the commercial value of rock crabs amounted to $46,000 in 1973 (ref. 160).

6.166 Shellfish Harvesting. Commercial shellfish stocks in eastern Long Island Sound, Block Island Sound, and Rhode Island Sound include: bay quahaug, ocean quahaug, softshelled clam, surf clam, oyster, conch, moon snail, mussel, bay scallop, and sea scallop. Distribution of soft-shelled clams, oysters, and bay scallops is limited to shallow bays, channels, and estuaries. Surf clams extend from the surf zone into deeper water, but in the study area stocks are generally limited to depths of less than 10 fathoms. The commercial landing of surf clams is low, only $4,000 for Rhode Island in 1973.

6.167 The most important shellfish in the Block Island - Rhode Island sound area is the ocean quahaug, and an active and expanding commercial fishery is found there. Commercial landings in Rhode Island for 1973 amounted to $250,000 (ref. 160) of which the majority originated from the sound areas. Recent harvests may be even higher, since this clam is replacing the surf clam in commercial use. Dense beds are being harvested in areas indicated in Figure 6-15. It is not unusual for a good crew to return to port with up to 350 bushels for 5 hours of effort. The density and expanse of the beds make this shellfish a valuable resource and harvesting of other stocks in the Sounds can



PRINCIPAL SHELLFISHING AREAS

FIG. 6-15

be expected in future years as the commercial importance of this clam increases.

6.168 Isolated beds of sea scallops are found in Rhode Island Sound; however, the populations are too small to support an intensive fishery.

6.169 In 1969, the Long Island Sound shellfish landings were valued at $954,000; of this $616,000 came from New York, and $338,000 from Connecticut ports. More than half of the landings were hard clams (bay quahaugs). The remainder, in order of importance, were oysters, conch meats, sea mussels, and soft-shelled clams. Bay scallop harvests are governed by individual town permits and are not included in landings figures.

6.170 Past Dredging and Disposal. There is little information on the past use of any of the proposed disposal sites, except the New London Site and Rhode Island Sound Site. Although much material has been disposed of at sea, the exact locations have not always been recorded. Only approximate or probable sites are known, especially for early projects. The Army Corps of Engineers has kept accurate records of how much material they have dredged and when.

6.171 The New London Site "has been used historically for disposal of an annual average of about 300,000 cubic yards of material for approximately the last 20 years," (FEIS). This includes 406,565 cubic yards dredged by the Coast Guard from New London Harbor in 1974. Recently, the Marine Historical Association, Inc., had 14,500 cubic yards from the Mystic River deposited there. The Navy has utilized the site for

deposition of 73,000 cubic yards from New London Harbor in 1972, 9,000 cubic yards from the harbor in 1975 and 1,500,000 cubic yards of material from the Thames River, also in 1975.

6.172 Prior to 1967, 1,960,000 cubic yards of material had been deposited in the Rhode Island Sound Site, mostly by the Army Corps of Engineers. In the years 1967-1971, 9.8 million cubic yards of material from the Providence River was deposited there as part of the COE Providence River Improvement Project. Another 100,000 cubic yards has been dredged there and deposited in the Providence River to complete the project. Other use of the site since 1967 has been by: the New England Power Company, (320,000 cubic yards in 1970); Montaup Electric Company, (17,000 cubic yards in 1970); The City of Providence (15,000 cubic yards in 1970); and the Great Lakes Dredge and Dock Company, (25,000 cubic yards in 1971).

6.173 Cornfield Shoals has received over 1,000,000 cubic yards of sand and other clean spoil over the past 20 years.

6.174 A summary of past dredging activity in this area is presented in Table 6-7.

6.175 Proposed Dredging and Disposal - Thames River. Proposed dredging in the Thames River itself calls for the removal of approximately 5.3 million cubic yards of material within the next 10 years, with most of it (4.9 million cubic yards) occurring by 1980. The Navy expects to remove 2.8 million cubic yards during this time period, while 15

TABLE 6-7

PAST DREDGING ACTIVITY

CONNECTICUT RIVER TO NARRAGANSETT BAY

Dredger	Dredge Site	Yr.	Amount (yd^3)	Probable Disposal Site
U.S. Coast Guard	New London Harbor	1943	406,565	New London
Marine Historical Assoc., Inc.	Mystic River	1974	14,500	New London
U.S. Navy	New London Harbor	1972	73,000	New London
		1975	9,000	New London
		1975	1,499,432	New London
New England Power Co.	Somerset, Mass.	1970	320,000	R.I.Sound
Montaup Electric Co.	Taunton River	1970	17,000	R.I. Sound
City of Providence	Fields Point	1971	15,000	R.I. Sound
Great Lakes Dredge & Dock Co.	Point Judith	1971	25,000	R.I. Sound
U.S. Army Corps of Engineers	Connecticut River	1971	288,211	land & open water 3 miles from dredge site
	Niantic Bay & Harbor	1971	35,000	open water 3 miles from dredge site
	Fall River Harbor	1963	379,900	open water 8 miles from dredge site
	Block Island-Harbor of Refuge	1968	10,300	open water 1 mile from dredge site
		1969	20,000	open water 1 mile from dredge site

TABLE 6-7 (CONTINUED)

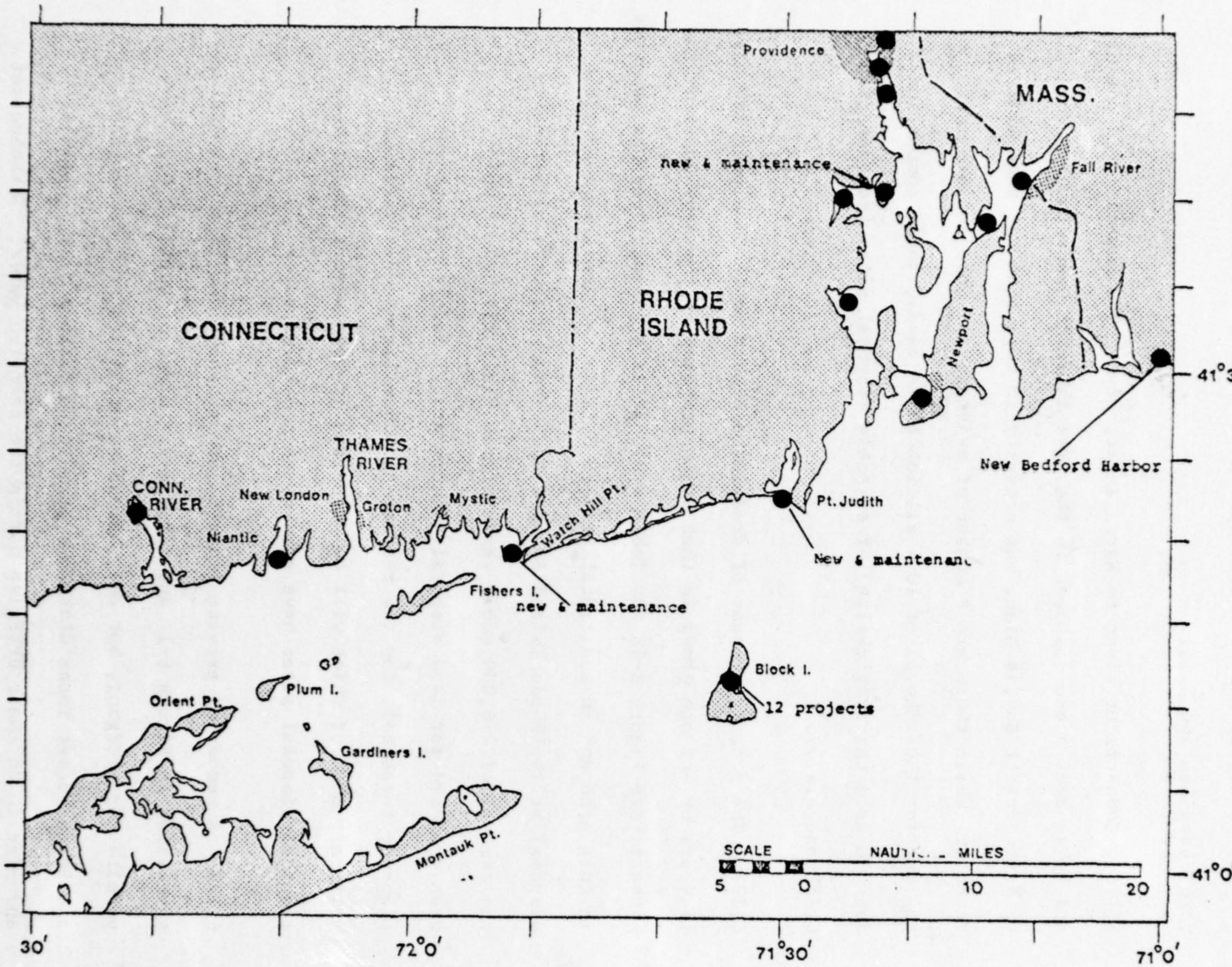
Dredger	Dredge Site	Yr.	Amount (yd^3)	Probable Disposal Site
U.S. Army Corps of Engineers	Block Island-Great Salt Pond	1972	56,446	open water 1 mile from dredge site
	Little Narragansett Bay & Watch Hill Cove	1961	10,160	open water
	Newport Harbor	1940	221,628	open water 10 miles from dredge site
	Pawtuxet Cove	1966	207,195	open water 16 miles from dredge site
	Providence River	1964	167,083	open water 6 miles from dredge site
	Providence River	1967-1971	9,800,000	R.I. Sound
	Seekonk River	1954	219,123	open water 22 miles from dredge site
	Point Judith Harbor of Refuge	1971	19,766	open water 15 miles from dredge site
	Warwick Cove	1966	237,388	open water 10 miles from dredge site & Oakland Beach

non-Navy dredging projects are expected to remove 2.5 million cubic yards (see Section 5.15).

6.176 Connecticut River to Narragansett Bay. The demand for dredging and subsequent ocean disposal in the area from the Connecticut River to Narragansett Bay is high, but activity in this area has been limited recently. While there are a number of existing and proposed projects calling for the removal of 10.4 million cubic yards, their completion depends upon the availability of suitable disposal sites (see paragraphs 6.178 and 6.179).

6.177 The greatest amount of dredging proposed to be done over the next 10 years by any one group is that being proposed by the Army Corps of Engineers (See Figure 6-16 and Table 6-8). It is planning three new projects in this area and an additional project outside the area, with possible disposal at the Rhode Island Sound Site. These projects will require the removal of 276,000 cubic yards of material, 253,000 of which has been proposed for land disposal. There are 17 maintenance projects planned; these call for the removal of 4.6 million cubic yards of material, most of which will be deposited in open water. Exact locations of disposal sites have not yet been determined.

6.178 A number of private projects are proposed for this area and are summarized in Figure 6-17 and Table 6-9. Eight of these already have permits for dredging, but only Northeast Utilities Service Company and Shennecosset Yacht Club have permits to dispose of the material and plan to do their dredging within the next two years. Shennecosset



PROPOSED CORPS DREDGING PROJECTS

FIG. 6–16

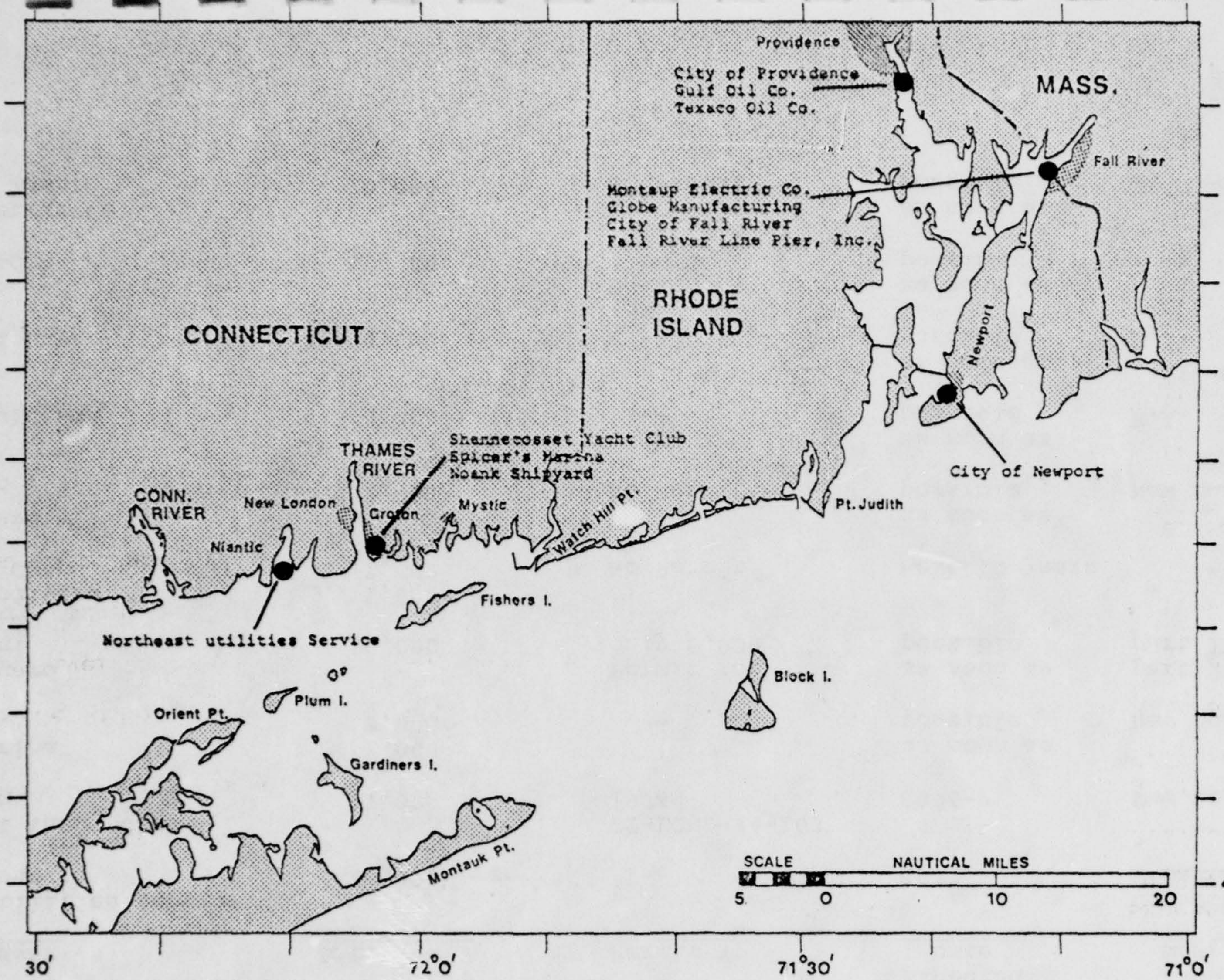
TABLE 6-8

PROPOSED CORPS DREDGING, CONNECTICUT RIVER TO NARRAGANSETT BAY

Dredger	Amt. (yd^3)	Expected Date	Expected Dump Site
Army Corps of Engineers-new projects			
Newport Harbor	15,000	--	R.I. Sound?
Brushneck Cove Warwick, R.I.	190,000	--	land
Pt. Judith Harbor	63,000	--	land
Buttermilk Bay Bourne, Mass.	8,000	--	R.I. Sound?
Army Corps of Engineers-maintenance projects			
Connecticut River	300,000/job	every 2nd year	land & open water
Niantic Bay & Harbor	40,000	1981	New London?
Aponaug Cove	50,000	1977	R.I. Sound?
Block Island Harbor of Refuge	25,000 25,000	1976 1982	-- --
Block Island-Great Salt Pond	50,000	1980	--
Bullocks Point Cove	240,000 350,000	1975 1982	R.I. Sound? R.I. Sound?
Little Narragansett Bay & Watch Hill Cove	20,000	1979	R.I. Sound?

TABLE 6-8 (CONTINUED)

Dredger	Amt. (yd^3)	Expected Date	Expected Dump Site
Newport Harbor	30,000	1978	R.I. Sound?
Pawtucket Cove	45,000	1975	R. I. Sound?
	50,000	1982	R.I. Sound?
Providence River	200,000	1980	R.I. Sound?
Seekonk River	100,000	1978	R.I. Sound?
Wickford Harbor	40,000	1977	R.I. Sound?
Pt. Judith Harbor of Refuge	30,000	1978	R.I. Sound?
	30,000	1984	
Warwick Cove	50,000	1977	R.I. Sound?
Fall River Harbor	150,000	1975	R.I. Sound?
	250,000	1984	R.I. Sound?
New Bedford Harbor	150,000	1987	R.I. Sound?



PROPOSED PRIVATE DREDGING PROJECTS

FIG. 6-17

TABLE 6-9

PROPOSED PRIVATE DREDGING, CONNECTICUT RIVER TO NARRAGANSETT BAY

Dredger	Amt. (yd^3)	Permit #	Expected Date	Expected Dump Site
Northeast Utilities Service Hartford, Conn.	40,000	--	1977	Cornfield Shoals
Shennecosset Yacht Club Groton, Conn.	17,000	CT-LOND-74-163 1974	1976-7	New London
Spicer's Marina Noank, Conn.	1,000-3,000	--	as soon as possible	New London
Mystic Shipyard Mystic, Conn.	10,000	Permit for only 5,000	as soon as possible	part New London-part land
Crocker's Boatyard New London, Conn.	1,000-2,000	No Permit	next 10 years	--
Noank Shipyard Noank, Conn.	2,000	No Permit	as soon as possible	New London
City of Providence	394,000	--	as soon as possible	R.I. Sound?
City of Fall River	4,800,000	--	as soon as possible	R.I. Sound?
City of Newport	15,000	--	as soon as possible	R.I. Sound?
Montaup Electric Co. Fall River, Mass.	20,000	No Permit	as soon as possible	R.I. Sound?

TABLE 6-9 (CONTINUED)

Dredger	Amt. (yd^3)	Permit #	Expected Date	Expected Dump Site
Fall River Line Pier, Inc. Fall River, Mass.	10,000-20,000	No Permit	as soon as possible	R.I. Sound?
Gulf Oil Co. Providence, R.I.	40,000-50,000	No Permit	within next 5 years	--
Texaco Oil Co. Providence, R.I.	140,000	No Permit	as soon as possible	R.I. Sound?
Globe Manufacturing Fall River, Mass.	10,000	No Permit	within next 5 years	R.I. Sound?

Yacht Club probably will not dredge the full permitted amount and is not sure if it will utilize the New London dumping grounds or not. The other projects that have been permitted are being held up for lack of suitable dump sites. The parties all expressed an interest in dredging as soon as possible.

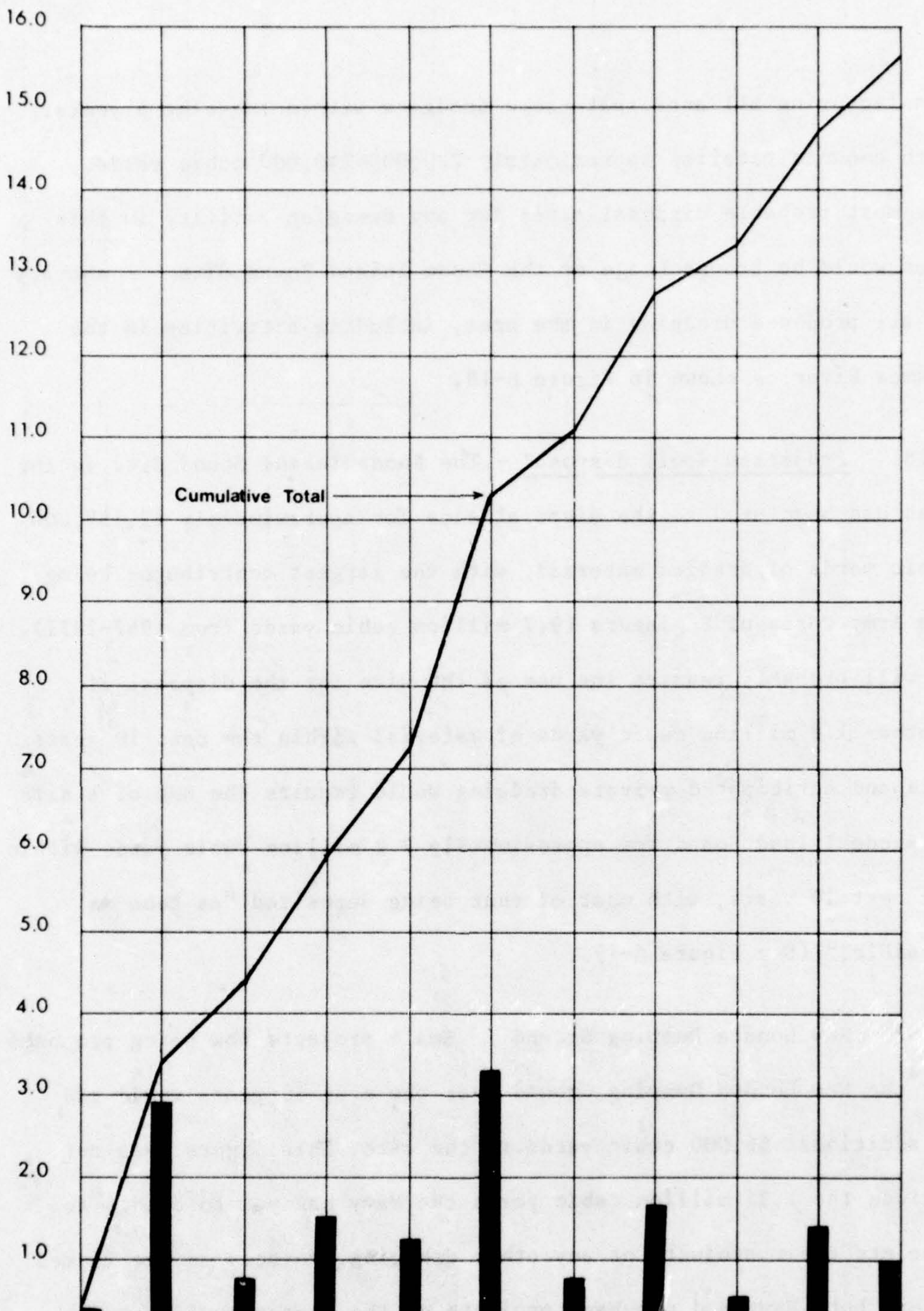
6.179 In the New London area, only Spicer's Marina and Mystic Shipyard have permits to dredge. Action on Spicer's permit has been delayed. Mystic Shipyard has a permit only for onshore disposal, although it is seeking permit modification to allow open water disposal and is applying for a new permit to dredge an additional 5,000 cubic yards. Several other marinas are interested in doing a small amount of maintenance dredging (1,000 - 3,000 cubic yards) but have not been able to get permits due to the controversy over the Navy's use of the New London Site. Most of these marinas do not have either the facilities or the approval of the town to dispose of the dredged material onshore and do not have the funds to dispose of it in open water any place but the New London Site. A strong interest was expressed in allowing smaller projects to go through different processes in obtaining permits than large projects (such as the Navy's), as the cumulative impacts of the small projects proposed would be minimal.

6.180 In the Narragansett Bay area, the Cities of Providence, Fall River, and Newport have permits to dredge amounts totaling 5,209,000 cubic yards but lack proper disposal sites. They would like to begin dredging as soon as possible. Montaup Electric Company, Fall River Line Pier Inc., Gulf Oil Company, Texaco Oil Company, and Globe

Manufacturing all anticipate some dredging within the next 5 years, with amounts totaling approximately 220,000-240,000 cubic yards. The most probable disposal sites for any dredging activity in this area would be Browns Ledge or the Rhode Island Sound Site. A summary of all proposed dredging in the area, including activities in the Thames River is shown in Figure 6-18.

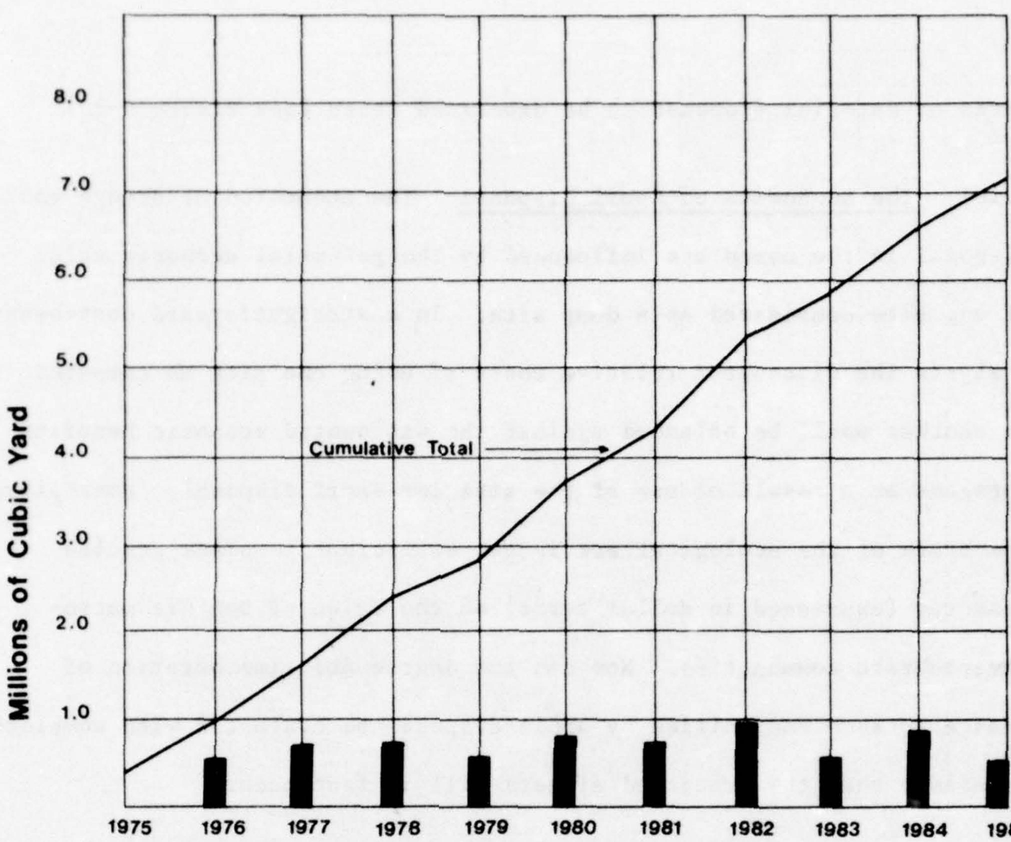
6.181 Projected Spoil disposal - The Rhode Island Sound Site in the past has been used as the disposal site for approximately 12,137,000 cubic yards of dredged material, with the largest contributor being the Army Corps of Engineers (9.7 million cubic yards from 1967-1971). It will probably require the use of the site for the disposal of another 1.8 million cubic yards of material within the next 10 years. This and anticipated private dredging would require the use of a site in Rhode Island Sound for approximately 7.2 million cubic yards within the next 10 years, with most of that being deposited "as soon as possible," (See Figure 6-19).

6.182 New London Dumping Ground. Small projects now being proposed for the New London Dumping Ground over the next 10 years would add an additional 66,000 cubic yards to the site. This figure does not include the 1.35 million cubic yards the Navy has yet to dredge to complete their project, or any other dredging projects on the Thames River. Both Navy and non-Navy projects on the Thames would require the disposal of approximately 5.3 million cubic yards. Demand for use of this site is high with a total of approximately 5.4 million cubic



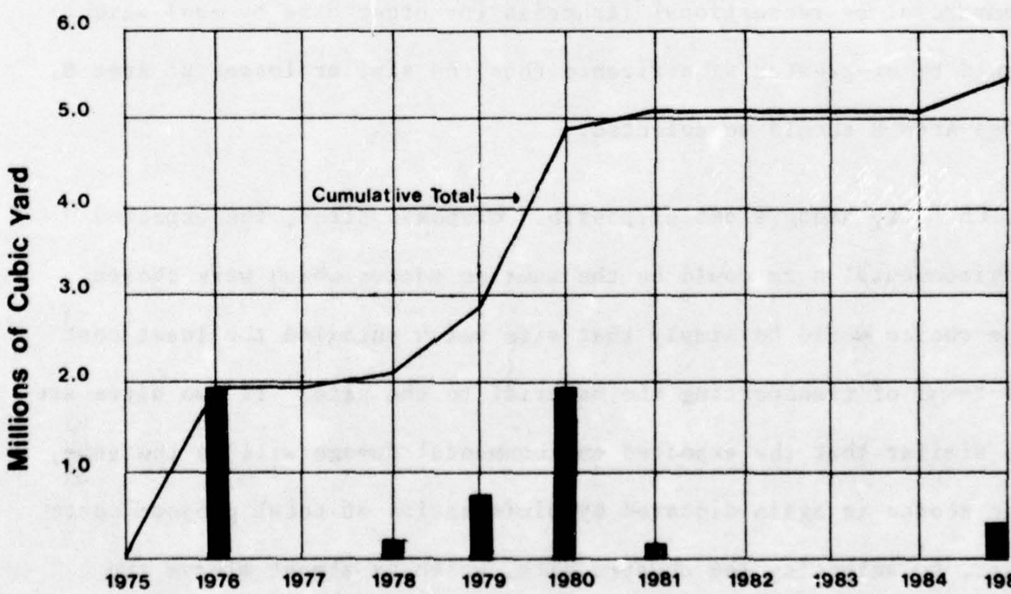
Dredging Activities Conn. River to Narragansett Bay Including Thames River (Annual and Cumulative)

FIG. 6-18



Likely Spoiling Future of Rhode Island Sound
Annual and Cumulative

FIG.6-19



Likely Spoiling Future of New London Site
Annual and Cumulative

FIG.6-20

yards of material proposed to be deposited there (See Figure 6-20).

6.183 The Economics of Spoil Disposal The economics of dredge spoil disposal in the ocean are influenced by the potential economic value of any site considered as a dump site. In a straightforward cost-benefit analysis the discounted relative costs of using one site as compared to another would be balanced against the discounted economic benefits foregone as a result of use of the site for spoil disposal. Unhappily, the state of the ecological art is not sufficient to place precise measures (expressed in dollar terms) on the value of benthic macro-invertebrate communities. Nor can the degree and time duration of damage to such communities by spoil disposal be evaluated with complete assurance that the predicted effects will in fact occur.

6.184 Accordingly, a decision process must consider relative damages: if it can be expected that use of Area A will result in losses to commercial or recreational fisheries (or other uses by man) which would be of greater significance than the similar losses at Area B, then Area B should be selected.

6.185 If, among a set of possible disposal sites, the expected environmental harm would be the same no matter which were chosen, the choice would be simply that site which entailed the least cost in terms of transporting the material to the site. If two sites are so similar that the expected environmental damage will be the same, the choice is again dictated by minimization of total project costs, i.e., by selecting the cheaper site, which is almost always the

nearest. Evaluation becomes more difficult when different values are involved; how does one equate the loss of a lobster fishery to denial of use for some military purpose, for example? If Area A appears to be more suitable in terms of inherent environmental values which may be adversely impacted than Area B but also is much more costly to use, the decision becomes difficult. When current and projected "values" cannot be translated accurately into monetary terms, the whole cost-benefit analysis process tends to break down. Most decisions concerning actions which may impact upon the environment and thereby come under the requirements of NEPA fall into this category. This being so, in the end the decisionmaker must exercise judgment. And that judgement must be illuminated by consideration of cost differentials as well as of "impact on the human environment." Expenditure of public funds, after all, also has an impact on the human environment inasmuch as dollars expended on one project are not available for use to carry out some other public purpose. Accordingly, it is necessary to discuss the relative costs of dredge spoil disposal as they vary from one area to another.

6.186 The factors which have the greatest impact on the costs of ocean disposal of solid wastes, including dredge spoil, are the geographical area in which the activity takes place, the type of waste, the volume of material to be disposed of, and the distance to the disposal site (ref. 264).

6.187 Geographical area is not of concern here. The fact that the

unit cost of dredge spoil disposal on the Gulf Coast is less than half of that along the Atlantic coast is not pertinent. The spoil under discussion here will all arise from the Thames River area; and if it is deposited in the ocean, this must take place within a relatively restricted area.

6.188 The physical and chemical characteristics of the waste are of somewhat greater significance. In general they contain less contaminants than most harbor spoils from other current or potential dredging projects from the southern coast of New England. This being so, there may be no clear-cut reason for selecting one site over another with respect to pollution of ocean waters. However, such pollutants as are contained in the spoils might be of some damage to animals living in or on the bottom (clams, lobsters, flounder, for example). Accordingly, a site not so inhabited would be preferable to one that was, even at some additional cost in terms of transport distance from dredge site to disposal area. Similarly, the physical qualities of spoil are such as to cause the loss by smothering of certain important benthic fauna whose presence is essential to the maintenance of harvestable species. In general, a site which represents a poor habitat for such species would be preferable to one which was richly endowed in this respect. Again, it might be desirable to pay some premium in transportation costs for the material to avoid such damage.

6.189 Costs are also affected by the amount of material to be disposed of. The larger the job, the greater the opportunity to take advantage

of economies of scale. This can be of considerable importance, because a large cost element in dredging and spoil disposal is that related to the mobilization and demobilization of the necessary equipment such as dredges, barges, and tugs.

6.190 The immediate project under review here is a rather large one, involving some 2,770,000 cubic yards of material; it will be managed as a single, continuous operation. Accordingly, the required effort will be of sufficient magnitude to guarantee realization of economics of scale, and it is not anticipated that the choice of marine disposal site for the spoil will strongly affect this aspect of the project one way or the other.

6.191 This leaves transport distance. The distance from dredge site to disposal site is always a factor in costing a dredging operation. In this case, it could be of real importance, because a number of potential disposal sites at widely varing distances from the mouth of the Thames are under consideration. In addition, while most of these are in inland waters, some are not. The cost of barging spoil in the open ocean are higher per ton-mile than for inland waters because of requirements for heavier vessels and more safety equipment imposed both by Coast Guard regulations and by nature (ref. 40).

6.192 As a first approximation, transportation costs are more or less uniform per ton mile. This holds true for distances in the same general range. However, for very long hauls the costs may rise substantially, because it will take more barges and tugs to handle the output

of a given piece of dredging equipment. This is, of course, attributable to longer "at sea" times for each round trip between pick up and discharge of cargo (ref. 66). For a site at a distance of 2.5 nautical miles, the round trip at 5 knots might take on the order of two hours, including time at the dump site; for a site 50 miles away the round trip time would be about 20 hours. The implied cost differentials can be smoothed out to some extent by the use of larger capacity barges and by careful scheduling of equipment, but clearly a significant incremental cost is entailed when haul distance is increased, even though ton-mile transportation cost is but a small element in the total cost per cubic yard; for long hauls it becomes a very important consideration.

6.193 Projected costs per cubic yard per mile have been derived from cost estimates in the Maguire report cited earlier (ref. 40). These costs are not presented as accurate forecasts but rather as indicators. They suggest that transportation costs in inland waters from the mouth of the Thames are about \$0.0464 per cubic yard per mile, while for transits of open ocean waters the cost is \$0.0523. Since the basic dredge and disposal costs are \$2.471 per cubic yard, transportation has little impact for short haul distances but becomes significant for the longer trips. The cost differential between New London dumping ground and the the Rhode Island Sound Site is on the order of 62 percent, being \$2.58 in the first case and \$4.18 in the second.

6.194 These estimates are for dredging, transport, and disposal operations only and do not include mobilization or demobilization

costs, which vary with the size of the project. However, since in this instance the amount of material to be removed is fixed, these should not affect total costs as much as transport distance; it could be expected, however, that the requirements for more equipment for longer hauls could add to such costs.

6.195 One other cost element which must be considered stems from regulatory requirements imposed on disposal operations because of environmental consideration. These require site monitoring before the start of operations and continued monitoring during and after the spoil disposal phase. Such costs are not particularly sensitive to distance from dredge site. They are affected strongly by past activity at the site; if a monitoring program has already been established at the site (as at New London, for example) the costs will be less than for an area which has never been so monitored. For sites which have been extensively monitored in the recent past, monitoring costs will lie between those for a site with an on-going program and those for a site with no past monitoring history. Monitoring costs in open ocean waters (as at the "Acid Barge" site, for example) can be expected to be higher than for inland waters. Rougher areas are to be expected in the ocean and this entails the use of heavier vessels and more rugged monitoring gear than in protected inland waters. Depths at open water sites will tend to be greater also, and this could add to the costs of monitoring (ref. 40).

6.196 Disposal Sites Considered. Browns Ledge. The Browns

Ledge Site lies approximately 50 nautical miles from the mouth of the Thames River at 41° 18.3' N latitude and 71° 04.1' W longitude. It is one nautical mile square with an average depth of 110 feet and is located about 2 nautical miles southeast of Browns Ledge proper.

6.197 Detailed current studies of the Browns Ledge site have been conducted by U.R.I. as part of a Corps of Engineers investigation into a regional disposal site (ref. 173). Current meters were placed ten feet above the bottom at the site center and in the middle of the southern side of the site for over 34 days of measuring.

6.198 The average current speed at each station was 0.18 knots. No current speeds were recorded in excess of 0.55 knots (0.94 feet per second) and only one in excess of 0.5 knots. The non-tidal drift was found to be 0.3 nautical miles/day to the ESE at the southern end of the site and 0.7 nautical miles/day to the ENE at the center of the site. Considerable variation in drift direction and speed was encountered and was attributed to the wind systems influencing the site at the time of measurement.

6.199 Maximum spring tidal current speeds of 0.3 knots were recorded in a NNW-SSE direction. It is thought by researchers at U.R.I. that wave induced currents would play a significant role in resuspension of sediments at the site.

6.200 A detailed summary of sediment investigations at Browns Ledge is presented in Environmental Assessment of Fall River Harbor Dredging and Browns Ledge Disposal (ref. 205). Sediments encountered varied

in grain size from gravelly sand to fine silty clay. None of the sediment results showed any correlation between sediment distribution and bottom topography. To quote the Environmental Assessment:

> "A tongue of relatively clean sand bisects the site. Near the center there is a localized concentration of gravel, comprising about 12% of the surface sample. Silt and clay fractions, comprising greater than 50 percent of the surface samples, is concentrated along the eastern boundary of the site and also in a small area in the southwest corner."

6.201 A bimodal distribution was detected in several samples. This may indicate fine suspended matter being deposited during calm weather and a transport of fine sand during periods of high waves or strong tidal currents.

6.202 Peak waves in the area are 26-32 feet with an 11 second period, 90% being at or less than 8 feet with a 9 second periodicity. Estimated peak-wave bottom velocity is 4.8 - 6.2 feet/second with 90% at 1.2 feet/second or less. In Meteorological Zone 5, the estimated 90% wave-induced velocity is equal to the erosion velocity of Thames River sediment at a depth of 80 feet. This would allow 30 feet of fill to be placed at Browns Ledge for a theoretical capacity of 41 million cubic yards. This theoretical capacity, based on computed wave induced velocities, will be used later as a comparator among sites.

6.203 The Applied Marine Research Group from the University of Rhode Island (ref. 205) inventoried the benthic fauna in the area of the disposal site and found the species and substrate composition to be similar to other areas of Rhode Island and Block Island Sounds.

6.204 The predominant taxonomic groups found throughout were amphipods and polychaete worms. Ampelisca agassizi was the dominating amphipod and others found included Unciola irrorata and Leptocheirus propinquis. Polychaete worms were represented by numerous species such as Clymenella torquata, Nepthys incisa, Lumbrinereis impatients and others. The most abundant mollusk was Periploma papyritium. The commercially important ocean quahaug, Arctica islandica was found in moderate amounts. Dive surveys conducted by the Army Corps of Engineers supplemented the other data. Motile fauna included the starfish Henricia sanquinolenta, some crabs, and lobsters.

6.205 Information obtained from the National Marine Fisheries Service, the University of Rhode Island, Olsen and Stevenson (ref. 160), and commercial fishermen indicates that the finfish and shellfish species listed in Table 6-10 inhabit the Browns Ledge area. Lobsters are moderately abundant, and the abundance of yellowtail flounder, whiting, butterfish, pollock, hake, fluke, and scup is such that harvesting of these stocks is commercially undertaken around Browns Ledge and areas to the south and east.

6.206 At Browns Ledge itself lobstering is the most productive commercial use. The Browns Ledge Environmental Impact Assessment (ref. 205) estimated the annual value of the lobster fishery at Browns Ledge to be in excess of $2,000.00 per square mile of habitat.

6.207 The bottom topography does not allow otter trawling on Browns Ledge proper, although some purse seining and longline fishing may

TABLE 6-10

Species Groups Used in Interview and Weighout Summaries

(New England Fishery Interviews, 1975)

Group	Species	Group	Species
Group 1:	Haddock	Group 9:	Other fish (groundfish)
			Monkfish
Group 2:	Cod		Cusk
			Drums
Group 3:	Silver hake		Eels
			Grenadiers
Group 4:	Yellowtail flounder		Red hake
			White hake
Group 5:	Other flounders		King mackerel
	Winter flounder		Redfish
	Summer flounder		Ocean pout
	Witch flounder		Pollock
	American palaice		Sculpins
	Windowpane flounder		Scup
	Halibut		Sea basses
			Sea robins
Group 6:	Sea scallops		Sea trout
			Sharks
Group 7:	Lobster		Dogishes
			Skates
Group 8:	Other fish (pelagic)		Smelt
	Bluefin tuna		Sturgeon
	Skipjack tuna		Tautog
	Tuna unclassified		Tilefish
	Trapon		Wolffish
	Swordfish		
	American shad	Group 10:	Other shellfish
	Menhaden		Green crab
	Atlantic mackerel		Red crab
	Argentine		Rock crab
	Sea herring		Johah crab
	Bonito		Shrimps
	Bluefish		Hard clams
	Billfish unclassified		Soft clams
	Anchovies		Clams unclassified
	Alewife		Conchs
	Butterfish		Sea mussels
	Crevalle		Oysters

take place. The commercial finfish harvest is low for the ledge itself but increases significantly for areas to the south and east (see Figure 6-13). The commercial fishery for Browns Ledge has been detailed in the Draft Environmental Impact Assessment of the site by the University of Rhode Island (ref. 205).

6.208 The site lies clearly out of any state jurisdiction and therefore lies under Federal control. Ocean disposal regulations govern disposal at this site. There are no known military uses of the area.

6.209 There is no official record of previous dumping at Browns Ledge, although fishermen at Point Judith have indicated dumping within the past 8 years. The Corps of Engineers is proposing to use the site for the disposal of 4.8 million cubic yards of material from Fall River Harbor; additionally Browns Ledge is being proposed as an alternative to the Rhode Island Sound Site for a regional spoil disposal site.

6.210 In terms of cost, Browns Ledge is not an attractive dumping ground. While considerably cheaper than the Munitions Site, Browns Ledge ranks slightly below the Acid Barge Site in terms of cost. The great distance from New London results in basic costs for transport and disposal substantially greater than for the Acid Barge Site. Mobilization-demobilization costs would be similar, with Browns Ledge slightly less costly than the Acid Barge Site on this score. Monitoring costs at Browns Ledge would be less than for the Acid Barge Site, for a number of reasons: there is a history of site monitoring; the site

is closer to shore than the Acid Barge Site; and it lies in "inland" waters. Summing up all cost elements results in a very slight indication of preference for the Acid Barge Site, although the differences between the two are not great.

6.211 Rhode Island Sound Site. The Rhode Island Sound Site is a square, one nautical mile on a side, with center coordinates of 41° 23.4' North, 71° 17.8' West, and sides bearing 23° True and 293° True. It is located on a relatively flat and featureless submarine plain in Rhode Island Sound some 5 nautical mile SSE of Newport, Rhode Island. Ocean disposal regulations govern disposal at this tie. Average depths within the area are about 100 feet, with a spoil peak in the southwest corner of the site. Depths over this peak are about 85 feet.

6.212 Approximately 12 million cubic yards of dredge spoil from the Providence River and other Narragansett Bay sites have been deposited at Rhode Island Sound Dump Site over the past 15 years. These spoils currently form the surface sediments at the site. MacMaster (ref. 132) indicates that, prior to dumping, sediments in this area were 10-15% silt and clay, with the remainder mostly fine to medium sand. Since the initiation of dumping, average silt-clay contents have increased to 35-40%. Sorting is generally poor, indicating some mixing of spoils with sandy predredge sediments. Sand found in portions of the area is believed to have been transported into the site rather than to have been derived from the spoils or underlying materials (ref. 176). It is postulated, however, that the fines will eventually be winnowed

from the spoils, leaving a stable, erosion-resistant lag deposit of sand. Pratt, Saila, and Sissenwine (ref. 176) pointed out that fine material is, in fact, leaving the site, primarily towards the southwest.

6.213 Saila, et al. (ref. 183) provided a summarization of bottom currents at this site as follows:

"1. Circulation is dominated by the semidiurnal tidal component.
2. Net transport is the daily average resultant of the tidal flow and is small.
3. The magnitude of the net "non-tidal" component of circulation may depend directly on the interaction of tidal currents in Narragansett Bay and Rhode Island Sound.
4. The direction of the non-tidal net component was consistently S-SE with a possible range of transport between 0.7 and 1.9 nautical miles per day.
5. Largest instantaneous speeds were recorded in the W-SW direction."

6.214 In evaluating these results Saila, et al. concluded that these currents alone were insufficient to erode and transport the fine sediments. Wave-induced velocities were felt to be the motive agents. Calculations presented in Section 6.95 indicate that peak bottom velocities at the site may be as high as six feet per second and that velocities may approach 1.2 feet per second frequently. Morton et al. (ref. 140) have reported that erosion of Thames River sediments can be expected

when near-bottom velocities exceed 1.7 feet per second. Thus, this site can be expected to contain these sediments much of the time. The work of Saila, et al., however, indicates that long term movement of fine material can be expected.

6.215 At the site, waves are less than eight feet 90% of the time and have an associated period of nine seconds. These waves would generate bottom velocities of 1.7 feet per second if depths were reduced to 80 feet. This gives the site a theoretical capacity of 35 million cubic yards.

6.216 Section 2.23k of the FEIS contains information on the commercial trawl fishery at and adjacent to the Rhode Island Sound Site. In addition to the trawl fishery, a floating trap fishery is also located at areas immediately north, northeast, and west of the Rhode Island Sound Dump Site. Major quantities of scup, bluefish, Atlantic cod, summer flounder, Atlantic mackerel, Atlantic menhaden, squid and striped bass have been landed in Rhode Island through this fishery. In 1971 the value of the catch was reported to be $727,000 (ref. 190). A decline in floating trap landings over the past decade has taken place, but Sissenwine and Saila (ref. 190) feel the decline is not attributable to disposal of dredge spoil but to a reduction in abundance of fish stocks all along the coast. Sport fishing for striped bass, bluefish, mackeral, cod, winter flounder, hake, and bluefin tuna takes place in and around this site. Fish distribution and abundance in Narragansett Bay and exchanges between the Bay and Rhode Island Sound have been studied by Oviatt and

Nikon (ref. 162) and Jeffries and Johnson (ref. 107).

6.217 Lobstering is conducted in rocky areas to the west, north, and northeast of the dump site. Although the fishery is relatively heavy, specific quantity data were not obtained. Some people interviewed report avoiding the dump site itself for fear of picking up contaminated lobsters.

6.218 Beds of ocean quahaug do exist around the dump site and have been described by Saila, Pratt, and Polgar (ref. 183). Interviews with shellfishermen indicate dead ocean quahaugs are found near the disposal site; when live clams are obtained, much of the meat is reported by the fishermen to be tainted. The present extent of the commercial shellfish effort at and around this site is much lower than it would be had the spoil not been dumped. *The main reasons for the reduction of harvest in this area are* lack of good returns for effort and fear of picking up contaminated shellfish.

6.219 The Rhode Island Sound Dump Site has been used to dispose of large amounts of spoil in the past. Future spoiling, as discussed in section 6.175, may approach 7.2 million cubic yards, even if Thames River sediments are not deposited there. This future, however, is uncertain. The site was under temporary court injunction, first issued on April 14, 1974 and modified on April 19 and March 5, 1974. No hearing was held for a permanent injunction against its use since, by agreement of the parties, disposal was redirected to an alternate site within the Providence River.

6.220 Additionally, disposal economics are a consideration in the use of this site for Thames River spoils. The long haul (37 nautical miles) to the site would entail a severe cost penalty, even though this would be mitigated to some extent by the fact that the entire passage would take place in waters covered by "inland rules of the road" regulatory requirements. Estimated operational costs for dredging, transport, and disposal would be on the order of $4.18 per cubic yard of material. This is about 60 percent greater than for the New London Site. Mobilization and demobilization costs for this site would also be somewhat greater than for a close-in disposal site because of requirements for more transport capacity in relation to dredging equipment. Monitoring costs at this site may be expected to be only slightly greater than for the New London site.

6.221 The Rhode Island Sound Dumping Site has been studied extensively in recent years following its use for disposal of highly contaminated sediments from Providence Harbor. Spot checking at the site continues. Thus, baseline data on sediments, on bathymetry, and on biological conditions could be largely drawn from existing data, and an extensive pre-dump site monitoring program would not be required.

6.222 Acid Barge Site. The Acid Barge Site, one square nautical mile in area, lies about 33 nautical miles from the mouth of the Thames River and about 8 miles South of Block Island at 41^{o} 02.5' N, 71^{o} 29.8' W.

6.223 Bathymetric studies show an average depth of 148 feet with bottom sediments of clean, moderately coarse sand (ref. 132).

6.224 Current studies conducted by NUSC (ref. 58) indicate bottom flows of 0.35± 0.25 ft/sec. and a net transport NW at 0.1 ft/sec. Peak waves are 26-32 ft. from the South and northwest (period of 8.11 seconds) with 90% of waves at less than 8' (with a period of 9 seconds). Peak wave bottom velocity is 3.4-4.2 ft/sec. with 90% of wave bottom velocity at or less than 0.7 ft/sec. At 80 feet, the 90% bottom velocity is 1.7, the erosion velocity of Thames River sediments. Thus, the site might be filled from its present 148 feet to 80 feet, for a theoretical capacity of 93 million cubic yards. The site lies in SSMO Meteorological Zone 5 with 34% of the weather winds flowing from the NE Quad and Peak winds coming from the N and NW.

6.225 No biological information is available on benthics for this specific site. However, commercial and research sources indicate a large amount of fisheries activity in this vicinity. It contains the most productive yellow tail flounder grounds in the region and is heavily fished for this species among others. In addition to the flounder, fish known to inhabit this area include: cod, pollock, hake, Atlantic mackerel, Atlantic bonito, white marlin, swordfish, and various trash fish species.

6.226 No information is available on shellfish at this site; however, a reasonable assumption would be that ocean quahaug, and perhaps surf clam, are present.

6.227 Inquiries made with the U.S. Army Corps of Engineers, local and State agencies indicate no past spoil disposal at this site,

other than the sinking of a barge containing sulfuric acid in 1945.

6.228 No indication of lobstering in the area was uncovered. If enough of the barge wreck remains to provide cover, it would be reasonable to assume that lobsters are present. The bottom conditions, however, would preclude burrowing by the lobster; and shelter would have to be found in the wreck.

6.229 Lying in the Atlantic Ocean, the site is well beyond the limit of any State jurisdictions recognized by Federal Law. There are no known military uses in the vicinity of the Acid Barge. Commercially, however, the area provides one of the most productive trawling areas for fishermen out of Stonnington, CT.

6.230 Using the Acid Barge Site for future disposal would have some significant economic implications. Much of the passage to the site would be through open ocean waters, imposing higher costs for transport vessels and safety equipment than for inland water sites. Thus, the costs for dredging, transport, and disposal at this site would be about the same as for the Rhode Island Sound Site, which is more distant but which is reached by an inland waters passage. Mobilization and demobilization costs are expected to be higher for this site than for the Rhode Island Sound Site. Ocean-going barges and tugs are not as readily available as those used for transport to inland disposal sites. This suggests that they might have to be transported a considerable distance to meet the project requirements. The site monitoring program for the Acid Barge Site would have to start from the beginning, since

there has been little or no past monitoring activity. In addition, the open ocean location of this site would lead to more expensive unit costs for monitoring activities than would be experienced at sites in more protected inland waters. Considering all of these factors, total costs for use of this site might be double those for use of a close-in site, such as the New London Site.

6.231 Munitions Site. The Munitions Site is clearly the furthest from New London, lying approximately 71 nautical miles from the mouth of the Thames River at 40 45.0'N, 70 50.2'W. The site is a square one nautical mile on a side with an average depth of about 200 feet.

6.232 Little information of a specific nature is available on the bottom sediments at the Munitions Site. Schlee and Sanko (ref. 188) have mapped silt and clay distributions in the New York Bight. By extrapolating their data, it appears that sediments in the area of the site contain between 25 and 50% silt and clay. Work by Garrison and MacMaster (ref. 86) indicates the dominant mode in this area to be sediment whose grain size is in the 0.144 - 0.288 mm range (fine to medium sand).

6.233 This site lies in SSMO Zone 5. Wind directions are from the NE 34% of the time with peak winds from the N and NW. Peak wave action has been measured at 26-32 feet with an 11 second period, 90% of waves, being less than 8 feet with a 9 second period. Peak wave bottom velocity is 2.0-2.7 feet/second; 90% of bottom velocities are less than 0.3 feet/second.

6.234 At a depth of 80 feet, 90% of the calculated bottom velocities would be less than 1.7 feet/ second (the erosion velocity of Thames River sediment), theoretically allowing 120 feet of fill and 164 million cubic yards of total capacity. This assumes that one square nautical mile would be devoted to spoil disposal.

6.235 The only available source of information on fisheries at the Munitions Site is the National Marine Fisheries Service. A review of the New England Fishery Interviews 1965 - 1974 printout (ref. 234), indicates that catches of finfish, shellfish, and lobster have been reported at coordinates corresponding to the area of the dump site. With the exception of yellowtail flounder the catches have been low. Nonetheless, species groups listed for catches from this area include haddock, cod, silver hake, yellowtail flounder, other flounders, sea scallop, lobster, other fish and shellfish. The species included in the 'other' species groups are listed in Table 6-9. The Munitions Site is roughly in the center of NMFS Statistical Area 537, and it may be assumed that the majority of the fish species listed in Table 6-9 inhabit this site.

6.236 Although lobsters are reported in the catch statistics from the Munitions Site, the yield is relatively low. Apparent reasons are; 1) lack of suitable habitat (sandy substrate) and 2) location well removed from the range of both the continental shelf lobster populations and the coastal populations. Information relevant to populations of rock, Jonah, and red crab is not available. NMFS catch statistics

report sea scallop harvestry and a species group designated as "Other Shellfish". It is not known what contribution ocean quahaug and surf clam make to the total hail. However, Saila and Pratt (ref. 184) report the presence of ocean quahaug and surf clam stocks in this area.

6.237 Fisheries catch information for NMFS Statistical Area 537, in which the Munitions Site is located, indicates that for the period of 1965-1974, 113,870,400 pounds of fish stock worth \$3.133,000 was harvested. However, between 69° and 72° W longitude there is little fishing effort; and the yield is low. The condition of the stocks is not known. While catches from the site are reported, the total hail for all months of the year and most fish species groups is also low. The only species group of which there is moderate hail is yellow-tail flounder (379,900 pounds for ten years). The nearest other area reporting (526) produces a yield twice that of 537.

6.238 There is no known information available on the benthics for the site.

6.239 The site lies clearly outside the jurisdiction of any State; but because of present and past uses, it is subject to the scrutiny of the military. Although no information is immediately available on the specific nature of the munitions dumped there, on-site research has been considerably curtailed because of the military usage.

6.240 No other past dredge disposal on this site is known.

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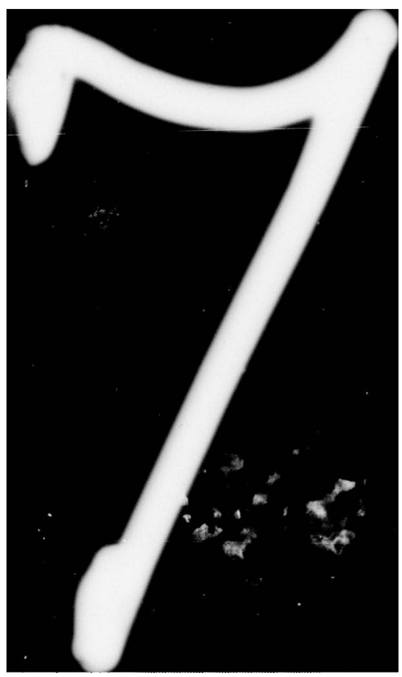
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6.241 The Munitions Site is by far the most costly site considered in this analysis. The great distance from New London and the necessity for transport in open ocean waters suggests that the basic dredging, transport, and disposal costs would exceed those at the New London Site by a factor of about 2.5. Mobilization-demobilization costs would also be large, again because of the distance and the necessity for obtaining heavy duty equipment capable of navigation in open ocean waters. Finally, there is no record of past site monitoring. Establishment of a monitoring program would be costly because of the distance from the nearest base port and the difficulty of conducting sampling in deep unprotected waters of the open sea.

6.242 Containment Site 1. This site, located between Gardiners Island and Montauk Point in the mouth of Napeague Bay, is not clearly defined by any surface features. The center of the site has been placed at 41^{o} 05.6' N latitude and 72^{o} 00.3 W longitude, and the outer boundaries of the site are described by a one nautical mile square. It is entirely within New York State waters.

6.243 The bottom at the site slopes gently to the north and east from a depth of about 54 feet to a depth of 65+ feet. The bottom sediments were analyzed by Savard (ref. 187) and Bertoni (ref. 12), and the former found a mean grain size of 0.06 millimeters (coarse silt) and sediments that were positively skewed with poor sorting. Bertoni mapped this area based on seismic reflection and found silty material probably high in organic content. As previously discussed, Bertoni considers

this area to be covered with post-Pleistocene lagoonal or estuarine deposits. This is further substantiated in a general way by information contained on NOS Chart 13205, which indicates soft bottoms throughout this area. Based on grain size information, especially mean grain size and skewness, the area may be classified as one where there is no active erosion of bottom sediments. Thus, the designation as containment site appears valid.

6.244 At the site, weather winds come out of the northeast quadrant 34% of the time with peak winds arising in the north and northwest. The peak waves (26-32 feet) come from the southwest, north, and northwest at periods of 6-7 and 10-11 seconds. Bottom velocities generated by those peak waves range from 7.7 to 9.6 feet per second. During 90% of the time waves are at 6 feet or less, have a period of 6 seconds, and generate bottom velocities of 0.7 feet per second. As previously stated, the erosion velocity for Thames River sediments is 1.7 feet per second, and this velocity would be achieved at a depth of 40 feet on the site. Thus for the site to function as a containment site the maximum fill depth would be 40 feet, and at that depth the site would have a capacity of 34 million cubic yards.

6.245 Current information on this site is based primarily on NOAA tidal charts, which reveal weak tidal currents to be present; maximum current readings were 0.6 knots on both the ebb and flood tides. General surface current trends may be derived from the work of Nalwalk *et al.* (ref. 148) in which surface drifters released northeast of the site were

found to leave Block Island Sound via Block Channel and be caught up in southwest longshore currents on the seaward side of Long Island.

6.246 While it is reasonable to assume that limited benthic sampling may have taken place at or near this site, specific information to that effect is not available. Although some commercial fishing is done in the area (trawling and trap netting), information on yield was not available at the time of this writing. However, fish known to inhabit Napeague Bay include black sea bass, cod, tautog, winter flounder, scup, mackeral, striped bass, bluefish, and numerous species of forage fish.

6.247 Harvesting of ocean quahaug is reported, however the extent is considered to be low to moderate. Scallop may be present in shallow areas. Information on the density and extent of stocks was not found.

6.248 Lobstering in nearshore and shoal areas takes place, but the yield is not known.

6.249 There is no direct military use of the site, however, there is a submarine anchorage area immediately to the north and care would be required in spoil dumping at the site to avoid reduction of depths in the anchorage area.

6.250 With the exception of the fishing already mentioned, there is no known use of the area for commercial purposes. There is no information available on past or proposed uses of this site either for spoil dumping or other purposes.

6.251 The transport distance from the mouth of the Thames to this site is about 13.5 nautical miles on an essentially straight course through inland waters. Hence, incremental transport costs would increase operational costs by about 20 percent over those for the New London Site. Mobilization and demobilization costs would be only slightly greater than for the latter site. Monitoring costs would be higher. There has been no known past monitoring activity at the site, so baseline data would have to be gathered prior to the commencement of operations. However, from a pure cost standpoint, this site would compare very favorably with the New London Site.

6.252 Containment Site 2. Containment Site 2 is located in Block Island Sound due west of Block Island with center coordinates of 41^{o} 13.8' north latitude and 71^{o} 41.7' west longitude. The site is one square nautical mile in area with its center approximately 21 nautical miles from the Thames River. It lies outside the jurisdiction of any State.

6.253 The bottom at the site is nearly flat and the depth is about 111 feet. The sediments have been examined by Savard (ref. 187), Danbom (ref. 61), and Gallagher (ref. 83). Savard mapped the sediments of the area as silty sand, while Danbom identified them through seismic reflectivity as coarse silt. Danbom's work showed positive skewness values. Savard and Gallagher's sediment measurements were used as the mean grain size data set to be compared with the reflection amplitude data obtained in Danbom's study. Savard assumes the source of sediment for this area to be a silty sand area to the northeast in Rhode Island

Sound (ref. 132). McMaster (ref. 132) feels the location of those sediments is due to westward bottom currents removing small-grained material from Narragansett Bay. The sediment information from this site indicates that deposition rather than erosion is the dominant process and thereby confirms a containment designation. Current information from the U.S. Coast and Geodetic Survey indicates flood currents up to 1 knot in a northwesterly direction at the site. Ebb currents tend to flow generally in an easterly direction, bifurcating to the north and south as they approach Block Island. The site is located in the northern current.

6.254 Bottom drifter studies (ref. 102) indicate general bottom transport towards western Block Island Sound. Surface drifter studies from a station south of Fishers Island indicate easterly movement towards Block Island. This corresponds with the prevalent wind directions at the time of the study.

6.255 As in the case of containment Site 1, the weather wind is out of the northeast 34% of the time, but the peak winds come from the north and northwest. The south and the northwest are the directions of origin for the peak waves which reach a height of 26 to 32 feet at 8 to 11 second periods and induce a bottom velocity of 4.7 to 6.0 feet per second. For 90% of the time the waves at the site are at or below the following measurements: 8 feet in height periodicity of 9 seconds and induced bottom velocity of 1.1 feet per second. With the 1.7 foot per second threshold erosion velocity for the Thames River sediments this site

could be filled up to a depth of 80 feet without exceeding its containment properties. Such dumping would give the site a capacity of 42 million cubic yards of spoil.

6.256 The community of benthic fauna at this site is believed to be typical of the area, and this is substantiatd by the work of Franz (ref. 74) who sampled two areas west of Block Island (one of which was in the vicinity of this Site) during the fall of 1971. The most abundant organism found was the gammaridian amphipod, Ampelisca agassizi. The grab samples included the small bivalve mollusk Nucula proxima, and such polychaete worms as Prionospio spp., Lumbrinereis tenuis, and Phyllodoce maculata.

6.257 This site lies in an area that experiences commercial fishing activity; however, the site itself is only moderately fished, providing very good fishing for a small number of boats for a short period of time. A nearby area to the east is heavily fished, indicating that stocks can withstand fairly substantial fishing pressure. Although specific catch data for the site are not available, species caught in the area include hake, Atlantic mackerel, bluefish, pollock, cod, tautog, flounder, bluefin tuna, fluke and many species of trash fish.

6.258 Containment Site 2 is in an area that is moderately to heavily fished for ocean guahaug, with other species of shellfish being taken incidentally in the harvest. Although the commercial yield is very high, varying stages of quahaug reproduction are present in plentiful quantities. Although little information was obtained concerning lobstering on the site, a lobster fishery is known to exist around Block Island.

6.259 There is no known military use of the site, and its commercial use as a fishing ground has just been cited. The only additional use to which the site is put is as part of the Block Island - Fishers Island acoustic range which is used by the Naval Underwater Systems Center and the University of Connecticut. No information is available on its past or proposed uses as a dumping site.

6.260 This site would require a passage of about 21 to 22 miles around Fishers Island. Total dredge, transport, and disposal operating costs would be about 34% greater than for the New London site. Since the additional transport distance implies more barges and tugs, the charges for mobilization and demobilization would be somewhat greater than for Containment Site 1 or for the New London Site. Save for some scattered studies carried out by a private citizen, there is no history of monitoring activity here. The costs of instituting a program and carrying it out through disposal operations and a post-disposal period would be similar to those for Containment Site 1.

6.261 Containment Site 3. This site is actually a combination of three separate depressions to the southeast of Fishers Island which have arbitrarily been designated A, B, and C. The coordinates for the three locations are as follows: A, 41° 14.5' north latitude and 71° 57.6' west longitude; B, 41° 15.3' north latitude and 71° 55.8' west longitude; and C, 41° 13.9' north latitude and 71° 55.0' west longitude. Locations A and B lie in New York State waters while area C is outside State jurisdictions. The average depth of the holes is 184 feet, 225 feet, and 250 feet respectively.

6.262 Bertoni (ref. 12) has reported the results of two piston cores near location C (sometimes referred to as the West Hole), one on the eastern slope at 140 feet and the other on the northern slope at 193 feet. In both samples the top 4 to 5 inches was coarse to medium sand with small pebbles. Both cores showed rhythmites (lacustrine) to the end. Bottom observations at location C by Cook and Morton (ref. 58) reveal what they consider a lack of sediment deposition since the time of deposition of lacustrine clays in the depression. It is the opinion of most authorities that this is a kettle hole.

6.263 Information on currents is available for an area adjoining location A (ref. 147) and for location C (ref. 58). Information on currents at area B must be inferred from these sources and from the USCGS charts.

6.264 Nalwalk _et al_. (ref. 147) measured currents at a station north of location A where water depths (95 feet) were approximately one half those found at area A. Currents were roughly parallel to east-west trending bottom contours and speeds were generally less than 1.2 knots. Current direction and speed appear similar for surface and bottom readings. Comparison of these velocities with velocities reported by USCGS shows the former to be conservative; U.S.G.S. charts indicate ebb currents reaching 2.2 knots and flood currents approaching 2.6 knots. The same information is applicable to location B. Conversations with local fisherman indicate that there may be local irregularities in current direction and velocity.

6.265 Cook and Morton (ref. 58) have carried out current and bathymetry measurements on location C, but they did not include bottom current measurements. The results were from an 8.5 hour period on August 7, 1974 and show that velocities reached 1.6 knots (prior to maximum flood) at a depth of 200 feet. Near-bottom currents were measured at velocities in excess of 1.0 knots.

6.266 Available information on the currents and sediments of these three depressions make it appropriate to change the designation from containment to dispersal. Strong tidal currents would in all probability disperse any spoil dumped here in a westerly direction toward the Race.

6.267 The same prevailing winds and peak wave heights that were applicable for Containment Sites 1 and 2 hold for this site. The peak wave will have an 8 to 11 second period and will generate the following bottom velocities at the three locations: A, 2.4 to 3.1 feet per second; B, 1.7 to 2.1 feet per second; and C, 1.3 to 1.8 feet per second. For 90% of the time the maximum wave would be 8 feet or less, with a period of 9 seconds and bottom velocities of 0.4, 0.2, and 0.2 feet per second for locations A, B, and C, respectively.

6.268 The capacities for A, B, and C respectively would be 7, 41, and 47 million cubic yards, if these depressions were filled to the level of the surrounding subaqueous terrain.

6.269 According to various studies within the area of Containment

Site 3, different faunal assemblages may be recognized. Along the northern side of locations A and B the benthic population was comprised of bryozoans, _Pectinaria gouldii_ and one burrowing form _Crangon septemspinosus_. The diversity of species within this area was very limited, perhaps due to the substrate composition. Small rocks and sand were found in the grab samples within this area. MACFC (ref. 226) obtained numerous burrowing organisms from grab samples taken within the vicinity of location C. High diversities were the result of abundance of macrofauna. _Ampelisca agassizi_, other amphipods, _Spiophanes bombyx_, _Clymenella zonalis_, other polychaete worms and bivalve mollusk, such as _Nucula proxima_ were obtained from the grab samples. The substrate within this area was composed of soft brown muds which are conducive to habitation by burrowing forms.

6.270 The area in and around Containment Site 3 is moderately fished for sport and commercial value. However, location B of this site lies in a dummy minefield and obviously trawling is not possible. Information on yield was not found, but major species known to inhabit this area include: Atlantic mackerel, pollock, bluefish, hake, cod, tautog, fluke, flounder, striped bass, bluefin tuna, and numerous species of forage fish.

6.271 Recent trawls through the eastern end of Containment Site 3 (ref. 226) captured such species as: smooth dogfish, big skate, little common skate, blueback herring, American shad, alewife, silver

hake, red hake, spotted hake, fourspot flounder, winter flounder, windowpane, butterfish, bluefish scup, weakfish, cunner, goosefish, Atlantic cod, ocean pout, sea raven, longhorn sculpin, longfinned squid, lobster, and Jonah crab. There is no doubt about the diversity and high productivity of this area.

6.272 Information on lobstering at the specific site was not found. However, Fishers Island Shoals and Cerberus Shoals are heavily "potted" resulting in a high yield.

6.273 Shellfishing, as reported by local boat captains in the immediate area, is limited by severe currents. Shellfishing on the periphery of the containment sites may be higher but specific information is not available. Ocean quahaug, however, are the principal shellfish harvested from this area. Commercial use of the site has been discussed previously with reference to the fishing. There are two military uses which are worthy of note. This site lies within the same acoustic range as Containment Site 2, and in addition, parcel B is in the Navy's practice mine field. There is no information available on either past or projected use of this site as a disposal area.

6.274 Distances to this site from the mouth of the Thames range from about 9 to about 11 nautical miles; the average distance would be just over 10 nautical miles. Thus, transport costs would be greater than for the New London Site but less than for Containment Sites 1 and 2. Mobilization and demobilization costs would

be only slightly greater than for the New London Site. Monitoring costs would be higher than for either Containment Site 1 or 2 because three distinct areas would have to be covered. Thus, total project costs for use of this site would probably be close to those for the more distant Containment Site 2 in spite of the greater transport distance required for use of the latter.

6.275 West Hole. This site southeast of Fishers Island has already been discussed in some detail as area C of Containment Site 3; and it is, in fact, a dispersal site. Its center point is at 41° 13.9' north latitude and 71° 55.0' west longitude, about 11 nautical miles from the Thames River. This location puts the site outside the jurisdiction of any of the states.

6.276 As was previously mentioned, Bertoni (ref. 12) reported the results of coring at 140 feet on the eastern slope of the hole and at 193 feet on the northern slope. This work combined with the work of Cook and Morton (ref. 58) support the position that this is a kettle hole with a bottom depth of 250 feet.

6.277 Current measurements and bathymetry were also part of the work done by Cook and Morton (ref. 58). Although current measurements were not taken at the bottom of the hole, near bottom measurements were taken on the slopes at a depth of 200 feet. The measurements showed velocities in excess of 1.0 knots and reaching 1.6 knots prior to maximum flood. Under wave conditions which would be prevalent 90% of the time, the bottom velocity would be 0.2 feet per second or less.

6.278 If the hole were to be filled to a depth of 180 feet, the estimated capacity would be 47 million cubic yards.

6.279 The substrate in the area is soft brown mud and conducive to habitation by burrowing forms of benthic fauna, and many such organisms were found in sampling done by the Middle Atlantic Coastal Fisheries Center in 1975 (ref. 227). The site is used for both sport and commercial fishing with most of the common species being found as reported in References 225 and 226 from the Middle Atlantic Coastal Fisheries Center. The area has a diverse species composition. Shellfishing in the immediate area is limited due to severe currents and probably increases with distance away from the site.

6.280 In addition to the fishing the site rests within the BIFI acoustic range, another human use. No information is available on either past or projected use of the site as a disposal area.

6.281 Because the distance to the site from the mouth of the Thames is about 11 nautical miles, the transport costs would be greater than for the New London Site but less than for either Containment Sites 1 and 2. Thus total project costs for use of this site would probably be somewhat less than for either of the other two Containment Sites.

6.282 East Hole. This site, east of Fishers Island, is a deep pocket at the eastern end of a more general depression of which West Hole forms the western end. The center of the site is located at 41° 13.9' north and 71° 51.0' west about 14 nautical miles from the mouth of the Thames.

The site has an area of about 1.8 square nautical miles, and its average depth is 170 feet. The location is outside the jurisdiction of any State.

6.283 East Hole is thought by Savard (ref. 187) to be related to the drainage patterns developed during periods of lower sea level. It is one of a pair of submerged valleys that cuts the submerged ridge between Montauk Point and Block Island. Sediment samples taken by Savard indicate a mean grain size of 0.125 millimeters (fine sand) on the southern shoulder of the depression. These sediments were finely skewed. The samples were taken in approximately 155 feet of water.

6.284 Detailed sediment coring of East Hole was carried out by the Corps of Engineers in 1974-1975 (ref. 208). Based on their information the following conclusions may be drawn:

1) Sediments along the northern boundary of the site approximate 50/50 percentages of sand/silt and clay.

2) A central band of high sand/silt and clay ratio runs SW-NE through the site. Typical values are 75% sand /25 % silt and clay.

3) The southern area of the site is characterized by a relatively high sand to silt and clay ratio, averaging slightly less than 70% sand, 30% silt/clay.

4) Gravel sized sediments were encountered infrequently, only in two locations in excess of 2%.

5) Sorting varied between good and very good for most of the sediments.

6) Cores into the substrates (1-2 feet below the surface) indicate the presence of clay deposits, possible glacial rhythmites referred to in sections covering West Hole.

6.285 Nalwalk *et al*. (ref. 147) performed current measurements at a station on the northern side of East Hole. Water depths encountered were in excess of 165 feet. Maximum surface current velocities were 3.2 fps and 2.9 fps, for ebb and flood directions respectively. Maximum current velocities of 2.0 fps were recorded for both ebb and flood directions at a depth of 165 feet. These measurements were made over one complete tidal cyle and were taken approximately 30 feet above the bottom.

6.286 Additional current measurements were carried out by Cook and Morton (ref. 58) and Morton and Cook (ref. 139). Data were gathered in the 1974 study for a one day period and in the 1975 study for a 41 day period. Mean maximum ebb and flood current velocities, measured near the bottom, were 0.94 fps and 1.22 fps respectively. A mean bottom current velocity of 0.28 fps towards the southwest and west-southwest was calculated.

6.287 A determination of friction velocities in the bottom boundary layer was made from the above mentioned current information in order to compare measured friction velocities with the friction velocities necessary

to erode Thames River dredge spoil. It appears that currents in the bottom boundary layer produce friction velocities that are significantly less than those required to erode the spoil material. Based on the information supplied in current studies by Morton, Cook and Massey (ref. 140) and in sediment cores provided by the Corps of Engineers, it is not possible to predict the fate of dredge spoil which would be dumped at East Hole. Current studies indicate that bottom critical velocities necessary to erode and transport material characteristic of Thames River spoil were not measured at East Hole, yet sediment studies of the site indicate this to be an area of moderately well sorted sand-sized sediment or an area of active sediment transport. East Hole is given a designation as a marginal containment site.

6.288 The prevailing winds and peak waves heights are the same for this location as for Containment Sites 1, 2 and 3. The peak wave will reach 26 to 32 feet and will have a period of 11 seconds. The bottom velocity generated by that peak wave will be 2.7 to 3.6 feet per second. The more prevalent condition, that is that occuring 90% of the time, would have a maximum wave of 8 feet with a 9 second period and would create a bottom velocity of 0.5 feet per second. The level of surrounding terrain and what has, therefore, been considered the limiting depth of fill would be 150 feet. At that depth the site would have a capacity of 50 million cubic yards.

6.289 MACFC (ref. 227) found <u>Ampelisca</u> <u>agassizi</u> to be the predominant organism within the area of the East Hole. <u>A</u>. <u>agassizi</u> comprised from

38 to 76 percent of the organisms in grab samples. *Lempocheirus propinguis* and 3 other gammaridean amphipod species were found in all the areas samples. Polychaete worms were found in abundance and include such species as *Spiophanes bombyx*, *Nepthys incisa* and *Lumbrinereis tenuis*. One mollusk, *Nucula proxima*, was found consistently within the area. At some of the sample stations, the commercially important ocean quahaug, *Artica islandica*, was obtained.

6.290 Although lobstering takes place in areas adjacent to East Hole, none is known to be conducted at the site itself. Some shellfish harvesting is reported for the ten minute grid, 411^{o} N, 715^{o} W; however, it is not known if any of the shellfish (which is not limited to bivalve species by NMFS species grouping) were actually harvested at East Hole. The depth of the site is close to the maximum effective depth of 200 feet at which hydraulic quahaugers operate. Finfish harvests for the 10 minute grid, 411 N, 715 W, are very low, with no harvests of haddock, scallop, lobster, or pelagic fish being reported.

6.291 The only other human use involving East Hole is the monitoring taking place there, and the periodic use of the BIFI acoustic range in which it falls. The Hole is not known to have been a dump site in the past, and the only projected plans for such a use are that it is an alternate under study should the New London Site be found unacceptable.

6.292 As was previously mentioned, the East Hole is approximately 14 nautical miles from the mouth of the Thames. The transport costs would be greater than for the New London Site but less than for Containment

Sites 1 and 2, while the mobilization and demobilization costs would be only slightly greater than for New London. The baseline monitoring costs would be less than for any of the three Containment Sites, and therefore so would the total project costs.

6.293 Dispersal Site 1. Dispersal Site 1 consists of two candidate dumping areas (DS1-A and DS1-B) in the Race between Long Island and Block Island Sounds, separated by Valiant Rock. DS1-A lies 7.2 nautical miles from the mouth of the Thames River at 41° 11.8' N, 72° 03.7' W and covers about 2 square nautical miles in area with an average depth of 219 feet. DS1-B lies 5.2 nautical miles from the Thames at 41° 13.9' N, 72° 02.5' W, covering 0.8 square nautical miles with an average depth of 230 feet. Because of the strong current activity and nature of the site, the capacity is virtually infinite, which in effect states that the location of the final deposition cannot be accurately predicted.

6.294 Sedimentary deposits have been analyzed by Bertoni (ref. 12) who took several piston cores from areas near DS1-B. The core numbers, locations and descriptions follow:

Core No.	Lat.	Long.	
1	41° 13' 17"	71° 54' 32"	Top 4 inches coarse to medium sand and small pebbles. Soft, plastic laminated silts to end of core.
14	41° 13' 72"	72° 03' 45"	Coarse sand and gravel with shell fragments in upper 1.5" of core. Remainder laminated micaceous silt and clay.

6.295 Savard (ref. 187) obtained grab samples relatively close to the site and reports a mean grain size of 5 millimeters. This probably represents a lag deposit which, when combined with the above information, indicates an area of active erosion and transport; thus a Dispersal Site.

6.296 Current velocities in the vicinity were measured by Nalwalk _et al_. (ref. 147). Surface readings varied between 0.7 knots at 150^{o} to 22 knots at 330^{o}. Bottom current readings varied between 0.24 knots and 2.2 knots. At the surface, ebb duration was 4.5 hours and flood 7.5 hours. Bottom durations were 2.5 hours (ebb) and 7.0 hours (flood). Based on this information, they estimated a net transport NW from DS1-A of approximately 8×10^{5} m^{2}/tidal cycle.

6.297 In addition to this information, tidal current charts published by NOAA provide current data on a more general scale. Reported maximum ebb surface currents vary between 1.0 and 4.5 knots, while maximum flood currents vary between 0.8 knots and 3.0 knots. Detailed bottom current information is not available for the specific site; but information gathered nearby reflects strong tidal currents sweeping across the site.

6.298 Dispersal Site 1 lies in SSMO Zone 6 with 34% of weather wind from the NE Quad and peak winds from the N and NW. Ninety percent of the wave action has been measured at less than 6 feet with a 6 second period; peak waves reach 26-32 feet from the SW, N, and NW with periods of 6-7 and 10-11 seconds. For DS1-A, peak wave-induced

bottom velocity is 1.8-2.2 ft/sec with the 90% value at approximately zero. DS1-B calculations indicate 90% of wave-induced bottom velocities at zero also and peak at 1.62.0 feet per second. At 40 feet, bottom velocity has been estimated at 1.7 ft/sec.

6.299 There is no detailed benthic information available for this site. This site contains a great diversity of fish life which is not commercially pursued because of the site's natural topography. However, there is very active sport fishery with bluefish, striped bass, pollock, cod, and mackerel the major species caught. Regions surrounding this dispersal site support fish populations which include the above mentioned species plus winter flounder, tautog, cunner, scup, black sea bass, fluke, and numerous species of forage fish.

6.300 Recent trawls through the eastern end of DS-1 (refs. 226, 227) captured smooth dogfish, big skate, little common skate, blueback herring, American shad, Alewife, silver hake, red hake, spotted hake, fourspot flounder, winter flounder, windowpane, butterfish, bluefish, scup, weakfish, cunner, goosefish, Atlantic cod, ocean pout, sea raven, longhorm sculpin, longfinned squid, lobster, and Jonah crab. There is no doubt about the diversity and high productivity of this area.

6.301 Information is not available on shellfish at this site. However, ocean quahaugs, bay quahaugs, and bay scallops are harvested in bay areas surrounding the Race.

6.302 This area of the Race to Fishers Island and Plum Island is very heavily fished for lobster. Of all the sites being considered, the environs of this site have the most valuable lobster fishery.

6.303 This site is actively used for sport fishing, lobstering and some dumping. Pfizer has dumped pearlite and process wastes into the Race; but no traces appeared on the bottom in 1972. (Watson, personal communications).

6.304 Both DS1-A and DS1-B lie primarily within the jurisdiction of New York State. DS1-A, however, lies partially in waters extending beyond New York's control.

6.305 Basic transportation costs would be only slightly greater than for the New London Site. However, this might be modified somewhat by a requirement for the use of more powerful tugs to cope with the strong tidal currents encountered in the Race. Also, dumping would probably be restricted to periods of slack water before the outgoing tide and during tidal ebb to insure dispersion of the material in a seaward direction. Thus, equipment utilization factors would be lower than for the Containment Sites in the same general distance range not so restricted operationally by tidal considerations. This would probably add to transport costs over and above the normal incremental distance charge and would probably also lead to additional requirements for equipment, adding to mobilization-demobilization costs. Monitoring requirements for dispersal sites have not been established as far as can be determined. However, it is to be expected that they might

be at least as great as, and probably greater than, those for a previously unmonitored containment site. Site monitoring will entail some biological sampling investigation of bottom sediments to insure that the material was in fact being dispersed as well. In addition, it would be necessary to monitor on the Long Island Sound side of the Race to insure that the material was being carried in a seaward direction as intended. This could be a particular problem with the area on the Long Island side of the Race, because the net tidal exchange through this passage is toward Long Island Sound; less difficulty would be expected on the Fishers Island side.

6.306 Dispersal Site 2. This site lies about 22 nautical miles from the mouth of the Thames in Block Channel, midway between Block Island and Long Island (41^{o} 03.5' N, 71^{o} 41.6' W) and beyond any State jurisdictions. The site covers approximately 3.5 square nautical miles at an average depth of 163 feet. Because of strong currents and bathymetric conditions, the estimated capacity approaches infinity.

6.307 Much less information is available on this site than on Dispersal Site 1. However, mapping by Savard (ref. 187) indicates the presence of moderately well sorted, negatively skewed sand in this area. Poorly sorted gravels mapped both east and west of the site are interpreted as morainal deposits. The sorting and negative skewness (coarsely skewed) of site sediments indicate a zone of dispersal and sediment transport. Being located at the head of the channel leading to deeper waters, turbidity currents could result from disposal here, enhancing

spoil transport into deep water.

6.308 NOAA charts show that maximum tidal currents vary at ebb from 0.3 knots to 2.5 knots (SE) and at flood from 0.6 knots to 1.8 knots (NW) indicating the dominance of ebb currents. Drifter studies by Nalwalk et al. (ref. 147, Figure 6-5) indicate that for their study period, surface currents tended out of Block Island Sound towards the Atlanic. Seabed drifters results were mixed due to recovery problems, but generally show a seaward drift (SW) as well.

6.309 Wave action is less than 8 feet with a 9 second period 90% of the time. Peak waves reach 26-32 feet with a period of 8-11 seconds in a S or NW direction. Wave-induced bottom velocity peaks at 2.9-3.0 feet per second, with 90% at less than 0.6 feet per second.

6.310 Dispersal Site 2 lies in SSMO Zone 5 with weather wind from the NE Quad 34% and peak winds from the N and NW. At the present time no benthic information is available for this site. However, the area in and around Dispersal Site 2 is heavily fished by both commercial and sport fishermen. Catches include winter flounder, yellowtail flounder, striped bass, pollock, Atlantic mackerel, bluefish, cod, tuna, white marlin, swordfish, Atlantic bonito, cunner, tautog and black sea bass among others. All interviews with fishermen revealed favorable reports about the good yellowtail flounder fishing which is listed commercially as a food fish.

6.311 Harvesting of shellfish (ocean quahaug) is conducted on a limited

scale on the sides and head of this dispersal site. Adequate information is not available on the density of the shellfish beds, or on species other than ocean quahaug that may inhabit the area.

6.312 Interviews with fishermen indicated lobstering is conducted in the region of Dispersal Site 2. While quantitative data are not available, the yield is believed to be moderate.

6.313 In contrast to Dispersal Site 1, this area is used for commercial as well as sport fishing. There are no known military uses for this specific area.

6.314 The passage from the site to the Thames is almost entirely through inland waters: hence, it might be possible to obtain a variance from Coast Guard regulations to permit use of vessels and equipment not certified for open ocean travel because of the very brief penetration of waters beyond the "inland rules of the road" area. If this could be arranged, dredging, transport and disposal operational costs might be about the same as for Containment Site 2, as would mobilization and demobilization costs. If no variance can be obtained, the heavier charges for both transport and for mobilization of ocean-going barges and tugs would prevail, making use of this site somewhat more costly. As at Dispersal Site 1, dumping could only take place on the outgoing tide which could lead to a degradation of equipment utilization factors and hence additional costs chargeable to transport and to mobilization-dem bilization. As with Dispersal Site 1, monitoring requirements are unknown. However, they would probably be more costly

than for Dispersal Site 1 inasmuch as most of the monitoring would take place in areas of heavy currents in both inland and open waters and, on the ocean side at least, would require the use of powerful vessels and rugged equipment. Considering all factors, the costs for use of this site might be comparable to those expected at the Rhode Island Sound Site or the Acid Barge Site.

6.315 Niantic Site. The Niantic Site lies about seven nautical miles from the mouth of the Thames River in a westerly direction at 41° 16.0' north latitude and 72° 10.9' west longitude. The site occupies one square nautical mile in this portion of Long Island Sound and has an average depth of 80 feet.

6.316 This site lies entirely within Connecticut State waters but is close to the New York boundary. It is not one of the four sites in Long Island Sound being considered for regional dumping. There are no court actions pending regarding the use of this site.

6.317 Sediments of the Niantic Site have been described by MACFC (ref. 225). Several cores taken near the site have been logged by U. S. Army Coastal Engineering Research Center (Williams, personal communication 1976). The MACFC sample is from the eastern edge of the area in 24.4 meters of water. The sorting of the sample is moderate (Sorting Index = 2.08), with a mean grain size of .35 mm (medium sand). The percentages of various grain sizes breaks down approximately as follows: gravel 9%, sand 79%, silt and clay 12%.

6.318 The closest core to the site analyzed by CERC is their core #6B, located approximately 1000 yards east of the area. It was taken in 55 feet of water and consists of: 4.5 feet of gray very fine sand overlying 6.0 feet of gray silt. The upper layer of fine sand is also recorded in another core, located just east of Black Point.

6.319 It would appear from the available data that the Niantic Site is a dispersal site, with the net transport being landward.

6.320 Current measurements at or near the Niantic Site have been published by NOS and by Dehlinger _et al_. (ref. 64). NOS charts indicate a maximum ebb current velocity of 1.8 knots and a maximum flood current velocity of 1.9 knots. Current directions observed at the peak ebb and flood current velocities trend east and west respectively.

6.321 Detailed current meter studies were carried out at the Black Point Station (approximate center of the dumping ground) by Dehlinger _et al_. (ref. 65). Studies were carried over two tidal cycles. Communication with D.L. Murphy indicates that surface tidal currents (ebb) reached 2.9 knots (east). The highest bottom current measured reported for the study was 1.5 knots, also from the east. These measurements were made approximately 5 days before the onset of spring tides and therefore do not represent the expected maximum currents.

6.322 Net transport (fig. 6-4) was computed to be approximately

1.7×10^{6} ft^{2}/tidal cycle, with a resultant current vector of 72^{o} (ebb dominant).

6.323 For approximately 34% of the time winds are from the northeast quadrant while peak winds arise in the north and northwest. The peak waves (26 to 32 feet) arise from the southwest, north, and northwest and have periods of 6 to 7 seconds and 9 to 11 seconds. Peak bottom velocities range from 6.6 to 8.2 feet per second. The condition which prevails for 90% of the time is waves of six feet or less at periods of six seconds and a bottom velocity of 0.4 feet per second.

6.324 The limiting bottom velocity would allow filling of this site to a depth of 40 feet giving it a capacity of about 54.7 million cubic yards.

6.325 MACFC (ref. 225), analyzed grab samples from the proposed Niantic Site. Medium sands characterized the sediment composition and the depth was 24 meters. Coarse sand fauna was characterized by the presence of the polychaete worm Nepthys picta and the decapod Cancer irroratus. Numerous polychaete worms were obtained such as Aricidea jeffreysii and Tharyx annulesus. Amphopod species included Ampelisca abdita, Unciola inermis, U. irrorata and U. serrata. The Shannon Weaver diversity index, a measure of the complexity and stability of the community, was highest of the four dump sites being considered within Long Island Sound.

6.326 As part of environmental work for the Millstone Nuclear Power Plant an investigation of the finfish resources in Niantic Bay has been

published by Northeast Utilities Company (ref. 156). The report lists 52 finfish species to be found in the Bay itself.

6.327 Both commercial and sport fishing takes place in the Niantic area. Commercial fishing is reported (through interviews) to take place more offshore, including the proposed site. Scup is the principle species caught. The sport fishery is located both into Long Island Sound itself, as well as a favored area at Block Point. Principal species caught are striped bass, bluefish, winter ,flounder, and fluke. The value or yield of the finfishing in this area is not known. Several charter boats are berthed at Niantic.

6.328 Shellfish stocks in the Niantic area include bay quahaug, oyster, bay scallop, and soft shelled clam. The quahaugs are harvested by commercial shellfisherman under special permit from the Connecticut Department of Agriculture, Aquaculture Division. Bay scallop stocks are found primarily in the Niantic River where harvesting is controlled by the Town. The yield and value of any of the shellfish harvests is not known.

6.329 Lobstering takes place in Niantic Bay as well as adjacent near-shore and offshore areas. Lobsters are also harvested from the proposed dump site. In comparison to other Long Island Sound dump sites, the lobster fisheries at the Fishers Island and Race areas, Long Sands Shoals, and Cornfield Shoals surpass that at Niantic. Again the yield and full value of this resource is not known, but it is estimated to be greater than that of the New London area.

6.330 In purely economic terms, the Niantic Site is attractive. Because of the short haul from New London, the dredging, disposal, and transport costs would be about 10 percent greater than for the New London Site. Mobilization-demobilization costs would be almost identical. An active program of biological monitoring of the Niantic area, including a sampling station in the middle of the site has been conducted in connection with the Millstone Nuclear Power Plant; accordingly, monitoring costs would be about the same as for New London. Thus, the total cost of dredge spoil disposal at this site would be only slightly greater than at the New London Site.

6.331 Orient Point Site. This site, one square nautical mile in size, is 11.5 nautical miles from the mouth of the Thames River at coordinates 41° 11.3' north latitude and 72° 14.4' west longitude. At this point in Long Island Sound the average depth is 150 feet, and the bottom configuration is a depression trending northwest to southeast toward Plum Gut.

6.332 The site, which lies entirely with New York State waters, is not currently in use nor are there any legal actions pending regarding its use.

6.333 Sediment analyses from the Orient Point Site have been presented in Reference 96. The sample location is on the southwest corner of the dump site in 39.7 meters of water. The mean grain size of the sediment is 0.41 mm (medium sand). The sample is moderately sorted with a grain size breakdown of approximately 7% gravel, 88% sand (50% medium sand) and 5% silt and clay.

6.334 Williams (1976 personal communication) indicates that in the area of Plum Gut (SE of site) ancestral drainage channels are found. The bottom sediments consist of a relatively hard substrate of coastal plain (Cretaceous age) sediments.

6.335 It appears that the area in question, especially the section nearest Plum Gut, is a dispersal area.

6.336 Current measurements at or near the Orient Point Site have been published by NOS and by Dehlinger et al. (ref. 65). NOS charts indicate a maximum surface ebb current of 4.5 knots, 2 hours after the current turns east at the Race. A surface flood current of 4.2 knots is indicated for 2 hours after the current turns west at the Race. Current directions observed at the peak ebb and flood current velocities trend southeast and northwest respectively.

6.337 Current meter studies were carried out near Orient Point by Dehlinger et al. (ref. 65) in connection with a circulation study of Long Island and Block Island Sounds.

6.338 Their study site was approximately 1/4 mile south of the dumping ground. Current meter data is for a semi-diurnal tidal cycle. Maximum surface velocities reported were 3.5 knots flood and 4.25 knots ebb. Near bottom current veolcities reached 2.9 knots flood and 3.0 knots ebb. At Plum Gut, net transport was calculated to be approximately 6.9×10^6 ft^2/tidal cycle with a resultant current vector of 183^o.

6.339 The prevailing winds at the site (34% of the time) are from

the northeast quadrant, while the peak winds come from the north and northwest. The peak waves (26 to 32 feet) are from the southwest, north and northwest with periods of 6-7 seconds and 9-11 seconds. The peak bottom velocities range from 3.3 to 4.1 feet per second. The 90% wave is six feet or less with a period of 6 seconds and generates a 90% bottom velocity of 0.0 feet per second. Based solely on wave induced bottom velocity the site could theoretically be filled to a depth of forty feet; however, tidal currents make this a dispersal site and therefore obviate discussion of total capacity.

6.340 The lowest diversity of species of the four dump sites within Long Island Sound occurred at Orient Point. MACFC (ref. 225) took grab samples within the area and found the substrate composed of medium sand grains. The amphipod Protohaustorius wigleyi was characteristic of the coarse sand sediments. The most predominant organisms were mullusks which included Astarte castanea and A. quadrans. Pratt (ref. 174) considers these two mollusks as part of a sand faunal assemblages.

6.341 Limited information on a trap fishery in this area is available. Fish known to inhabit this area are similar to those at Dispersal Site 1 and Containment Site 1. Shad are known to pass through Plum Gut during their migration to the Connecticut River, and they have been caught in trap nets set in this area.

6.342 The lobster fishery is generally held close inshore, and no other information on yield and/or value was found. No information on shellfish

was found.

6.343 The Orient Point Site is at about the same distance from New London as Containment Site 3C-West Hole; costs for dredging, transport, and disposal at the two sites would, therefore, be about the same, with Orient Point only marginally more expensive. Mobilization-demobilization costs would be about the same for the two sites. Recent monitoring in the area has created a bank of baseline data; however, the necessity for monitoring wide areas because of unusual tidal currents between Long Island Sound and Gardiners Bay would probably add significantly to monitoring costs at this site. On balance, then, the cost of disposal at Orient Point would probably be slightly greater than at West Hole, although the differences would not be great.

6.344 Cornfield Shoals Site. This one square nautical mile site is located 15 nautical miles from the mouth of the Thames River in Long Island Sound at coordinates 72° 20.5' west longitude, 41° 13.3' north latitude. The bottom slopes east and south from approximately 125 feet with an average depth of 115 feet. The New England Division, Army Corps of Engineers is currently evaluating two applications to dispose of materials at this site. One application concerns disposal of rock, while the other concerns disposal of a small amount of dredge spoil. These materials were originally scheduled for disposal at the New London site, but a court order prevented its use.

6.345 This site lies entirely in Connecticut waters. No legal actions

regarding use of this site are pending.

6.346 Sediments from the Cornfield Shoals Site have been analyzed for MACFC in connection with its environmental baseline study of Long Island Sound (ref. 225). The sample was taken from the southwest corner of the area in 42.7 meters of water. The sample analyzed was approximately 47% gravel, 48% sand, and 5% silt and clay and was moderately sorted (Sorting Index =2.06). The mean grain size was 1.26 mm (very coarse sand). According to unpublished data from Haskell (personal communication, 1976), the bottom sediments of the site are primarily sand with some shell fragments and gravel.

6.347 Geophysical studies of Long Sand Shoals (north of dumping ground) by CERC (Williams, 1976, personal communication) indicate that the shoal may be a cuesta of semi to loosely consolidated coastal plain sediments (Cretaceous) capped by a varying thickness of recent sediments (sand). Morton and Cook (ref. 139) feel that the shoal will act as a barrier, preventing spoil from reaching the Connecticut shore. Unpublished data from Haskell (personal communication, 1976) indicates the existence of several irregularities in the shape of the shoal, projecting towards the southwest; these act to deflect tidal currents (which normally run along the southern edge of the shoal) back over the shoal in a landward direction. The dumping ground as indicated on NOS charts will not be influenced in such a way; however, were dumping to take place at sites short of the designated site, the above situation might occur.

6.348 Current measurements for the Cornfield Shoals area have been published by NOS and Morton and Cook (ref. 139). NOS current information is for the eastern end of Long Sand Shoals, approximately 2000 yards northeast of the dumping ground. These charts indicate a maximum ebb current, at the surface, of 1.8 knots. Maximum surface flood currents of up to 2.5 knots are reported at the same station. Flood currents trend west-southwest and ebb currents trend east-northeast.

6.349 Morton and Cook (ref. 139) reported current meter results for 14 to 24 day periods. Two current meters, approximately one meter above the bottom, were located at the northwest (24 days) and the southeast (14 days) corners of the dumping grounds. Their results indicate a strong semi-diurnal tidal influence. Generally, higher current velocities were found at the southeast meter, with average ebb currents greater than average flood currents at both stations. The highest velocity recorded was approximately 2.5 fps at the southeast meter. Average current velocities at the southeast meter were 2.1 fps during ebb and 1.8 fps during the flood tide. At the northwest station average ebb and flood velocities were 1.6 fps and 1.2 fps respectively.

6.350 Progressive vector plots of the current readings reveal a net northwesterly drift at the southeast meter and a net westerly drift at the northwest meter. According to Morton and Cook, the net directional differences in current velocity between the two sites result from the barrier effect of Long Sand Shoals. It appears that water heading onshore has its velocity reduced and net drift altered toward the west

by the shoal. Mean velocity (ebb-flood) for the southeast station is 0.37 fps (319°) and 0.32 fps (285°) for the northwest station.

6.351 From the above information it would appear that the Cornfield Shoals Site would be a dispersal site with Long Sand Shoal acting to modify the strength and direction of dispersal.

6.352 Although peak winds at the site come from the north and northwest, the prevailing winds (34% of the time) arise in the northeast. The peak wave is 26 to 32 feet from the southwest, north and northwest with periods of 6-7 seconds and 9-11 seconds. The bottom velocity generated by those peak waves ranges from 4.3 to 5.9 feet per second. The 90% wave is six feet or less, has a period of six seconds, and generates a bottom velocity of 0.1 feet per second. This is a dispersal site which makes discussion of capacity academic.

6.353 MACFC (ref. 225) sampled the macrofauna within this dump site. Sediments were primarily composed of gravel and coarse sands thus indicating organisms from a deep (43 meters) coarse-sand faunal assemblage. The shoals are located in the eastern portion of Long Island Sound; therefore similarities in species composition to Rhode Island Sound might be expected. As in similar sand sediments in Rhode Island Sound, numerous amphipods were obtained such as Ampelisca vadorum, Unciola irrorata, Phoxocephalus holbolli and Stenopleustes gracilis. Organisms found within shallow sand and deep silt clay sediments of Long Island Sound were exemplified by Ampharete arctica and Nassarius trivitattus. Many molluscan species were also obtained

such as Musculus corrugatus and Venericardia borealis.

6.354 The mouth of the Connecticut River and Long Sand Shoals constitute a unique fishery resource in Long Island Sound. Since the Connecticut is the largest river discharging into the Sound, it represents the largest potential migratory route for shad, salmon, and other anadromous fish. It may be assumed that nearly all of the one hundred or so finfish species known to inhabit Long Island Sound can be found in this general locale.

6.355 Commercially important finfish in this area include the shad, menhaden, alewife, scup, and flounder. Equally important are the expenditures which have been made to restore and/or improve the Connecticut River for Atlantic salmon, sea-run brown trout, glut herring, alewife, shad, sturgeon, and striped bass. Shad migration through the area has been studied and described by Dodson et al. (ref. 68). Due to the nature of reporting statistics, information on finfish yield and/or value of the resource for the area was not available. While the major trawling sites are south of Long Sand Shoals, a limited amount of trawling takes place at the river mouth for winter flounder and lobster bait. Gill netting of shad takes place up the river.

6.356 The lobster yield of Cornfield Shoals and Long Sand Shoals is the largest of the study sites west of the Race. One lobsterman reports that a good catch may be as high as 200-250 pounds for two tidal cycles (Staplin, personal communications).

6.357 Harvesting of oysters takes place in South Cove (near the mouth of the River), west of Griswold Point, and in a small area between Lynde Point and Long Sand Shoals. Data on yield is not available nor is it known how intense the fishing is.

6.358 Of the several dispersal sites examined, only Dispersal Site 2 is more costly than Cornfield Shoals. The distance from New London (about 15 miles) adds to both basic transport and disposal costs and mobilization-demobilization costs. There is some base line monitoring data available for the site, but even so monitoring would be quite expensive because of the necessity for sampling over a wide area in a region of Long Island Sound characterized by currents of unusual complexity.

6.359 Summary and Site Comparison. The data presented in the site-by-site discussions above are summarized in Figure 6-21. They form the basis for the comparison of site suitability which follows.

6.360 It is obvious from both the text and Figure 6-21 that none of the suggested alternative disposal sites is so clearly preferable in terms of meeting the requirements of NEPA as to preclude more than perfunctory consideration of the others. In fact, since each site offers both advantages and disadvantages, a clear-cut decision is not easy to reach. This is attributable to the fact that none of the sites approaches the ideal for a spoil disposal site.

6.361. The ideal spoil disposal site would have the following

SITE INFORMATION SUMMARY		BROWNS LEDGE	RHODE ISLAND SOUND DUMP SITE	ACID BARGE	MUNITIONS DUMP	CONTAINMENT 1	CONTAINMENT 2	CONTAINMENT A	B
SPOIL RETENTION	containment	●	●	●	●	●	●		
	dispersal							●	●
LOCATION	water body	Rhode Island Sound	Rhode Island Sound	Atlantic Ocean	Rhode Island Sound	Block Island Sound	Block Island Sound	Block Island Sound	
	distance	50 NM	36.8 NM	32.6 NM	71 NM	13.5 NM	21.4 NM	9.2 NM	10.5 NM
	latitude	51°19.5' N	41° 23.4'N	41° 02.5' N	40°45.0' N	41° 05.6' N	41° 13.8' N	41°14.5'N	41°15.3'N
	longitude	71°5.4' W	71° 17.8'W	71° 29.8' W	70°50.2' W	72° 00.3' W	71° 41.7' W	71°57.6°W	71°55.8'W
PHYSICAL	size	1 NM²	1 NM²	1 NM²	1 NM²	1 NM²	1 NM²	.9 mil sy	1.9 mil sy
	bottom contour	slope gently to SE	flat	flat	slope gently to S	flat	flat	holes	
	average depth	110 ft.	106 ft.	148 ft	200 ft.	65 ft	111 ft	184'	225'
	estimated capacity	41 mcy @ 80 ft.	35 mil cy @ 80'	93 mil cy @ 80'	164 mcy	34 mil cy @ 40'	42 mil cu yd @ 80'	7 mcy @160'	41mcy@16
CURRENTS	surface tidal	--	--	--	--	1.0 ft/sec	1.7 ft/sec	4.1 ft/sec	
	bottom tidal	<.94 fps	--	0.35 ± 0.25 ft/sec	--	1.0 ft/sec	1.7 ft/sec	4.1 ft/sec	
	bottom net drift	0.3-0.7 n.m./day	0.7-1.9 NM/day S-SE	1.4 NM/day, NW	--	not available	W	not available	
METEOROLOGY	zone	5	5	5	5	6	5	5	
STORM & STORM CURRENTS	peak wave	26-32 ft; 11 sec	26-32'; 8-11 sec.	26-32 ft; 8-11 sec	26-32 ft; 11 sec	26-32 ft, 6-7&10-11sec	26-32ft, 8-11sec S&NW	26-32'	8-11 s
	90% peak wave	8 ft; 9 sec	8 ft; 9 sec.	8 ft; 9 sec	8 ft; 9 sec	6 ft, 6 sec	8 ft, 9 sec	8', 9 sec	
	peak wave bv	7.2-9.2 ft/sec	4.8-6.1 ft/sec.	3.4-4.2 ft/sec	2.0-2.7 ft/sec	7.7-9.6 ft/sec	4.7-6.0 ft/sec	2.4-3.1	1.7-2.
	90% peak wave bv	2.0 ft/sec	1.2 ft/sec.	0.7 ft/sec	0.3 ft/sec	0.7 ft/sec	1.1 ft/sec	0.4	0.2
	bottom velocity	1.7 ft/sec @ 80 ft	1.7 ft/sec @ 80 ft	1.7 ft/sec @ 80 ft	1.7 ft/sec @ 80 ft	1.7 ft/sec @ 40 ft	1.7 ft/sec @ 80 ft	1.7 ft/sec @ 80 ft	
SEDIMENTS	past spoiling	none known	12 million cu yd	none known	none known	none known	perhaps 19,000 cy	none known	
	physical data	mostly silty sand	spoil, winnowing	clean, m. coarse sand	fine-medium sand	coarse silt pos. skewness	silty sand to coarse silt, pos. skewness	coarse to med. sand	
SITE USE & VALUE	trawling	●	--	●	--	●	●	●	--
	sport fishing	●	●	--	--	--	--	--	--
	shell fishing	--	●	●	--	●	●	●	●
	dumping	--	●	--	--	--	--	--	--
	sand/gravel	--	--	--	--	--	--	●	--
	military	--	--	--	●	--	--	●	●
	acoustic range	--	--	--	--	--	●	●	●
REGULATORY	EPA	●	●	●	●	--	●	●	●
	Army COE	●	●	--	--	●	--	--	--
	state	RI, MA	RI	--	--	NY	--	NY	NY
BIOLOGY	benthic fauna	Numerous polychaete worms: *Clymenella torquata, Nepthys incisa, Lumbrinereis impatiens*, dominant anthropod was *Ampelisca agassizi*, *Periploma papyritium* was the abundant mollusc	*Ampelisca agassizi Nepthys incisa Ampharete acutus*	(not available)	(Not available)	(not available)	*Ampelisca agassizi Photis dentata Prionospio sp Lumbrinereis*	sparse Bryozoana *Pectinaria gouldi* *Ampelisa agassizi* abundant worms numerous polychae	
	fish	Lobster, Ocean quohaug, Winter flounder, Yellowtail flounder, Whiting, Butterfish, Fluke, Scup, Cod, Menhaden, Herring, Bluefish, Striped bass, Pollock, Hake, Swordfish, Groundfish	scup, bluefish Atlantic cod, summer flounder, Atlantic mackerel, Atlantic menhoden, squid, striped bass, Lobster, Ocean quohog	Yellowtail Flounder, Atlantic cod, Pollock, Hoke, Atlantic mackerel, Atlantic bonito, White marlin, Swordfish, Lobster, Ocean quohog	Haddock, Cod, Silver Hake, Yellowtail flounder, other flounder, Groundfish	Black sea bass, Cod, Toutog, Flounder, Scup, Mackerel, Striped bass, Bluefish, Lobster, Ocean quohog	Hoke, Mackerel, Bluefish, Pollock, Cod, Toutog, Flounder, Bluefin tuna, Fluke	Atlantic mackerel, Bluefish, Hoke, Co Flounder, Fluke, S Bluefin tuna, Dogf Blueback herring, Weakfish, Cunner, Pout, Sea raven, S Squid, Lobster	

*Also known as WEST HOLE

#Data from Plum Gut

SITE INFORMATION SUMMARY

FIG.6 -21

...MENT 2	CONTAINMENT 3 A	B	C*	EAST HOLE	DISPERSAL 1 A	B	DISPERSAL 2	NEW LONDON	NIANTIC	ORIENT POINT	CORNFIELD SHOALS
●				●				●	●		
	●	●	●		●	●	●			●	●
...nd Sound	Block Island Sound			Block Island Sound	BI & LI Sounds		BI Sound, Atlantic	Long Island Sound	Long Island Sound	Long Island Sound	Long Island Sound
	9.2 NM	10.5 NM	11.0 NM	14 NM	7.2 NM	5.2 NM	21.6 NM	2.5 NM	7 NM	11.5 NM	15 NM
N	41°14.5'N	41°15.3'N	41°13.9'N	41°13.9' N	41°11.8'N	41°13.9'N	4.°03.5'N	41° 16.3' N	41°16.0' N	41°11.31 N	41°13.3' N
W	71°57.6"W	71°55.8'W	71°55.0'W	71°51.0 W	72°03.7'W	72°02.9 W	71°41.6'W	72° 04.6' W	72°10.9 W	72°14.4' W	72° 20.5' W
	.9 mil sy	1.9 mil sy	2.0 mil sy	1.8 NM^2	2 NM^2	0.8 NM^2	14.3 mil sy	1 NM^2	1 NM^2	1 NM^2	1 NM^2
	holes			valley trend E-W	channel		channel	shallow dep w/mound	slopes to S & W	depression	slopes E & S
	184'	225'	250'	170 ft.	219 ft	230 ft	163 ft	70 ft	80 ft.	150 ft.	115 ft.
yd @ 80'	7 mcy @160'	41mcy@160'	47mcy@180'	50 mcy	-		-	41 mil cy @ 40'	55 mcy @ 40 ft.	-	-
sec	4.1 ft/sec			5.4 fps ebb	7.6 ft/sec		4.2 ft/sec	2.4 ft/sec	4.9 fps (ebb)	7.6 fps ebb #	4.25 fps (flood)
sec	4.1 ft/sec			1.22 fps	3.7 ft/sec		4.2 ft/sec	1.7 ft/sec	2.5 fps	5.1 fps ebb #	2.5 fps (ebb)
	not available			--	0.6 NM/day, E		seaward	2.8 NM/day, E	--	--	--
	5			5	6		5	6	6	6	6
11sec S&NW	26-32'	8-11 sec, S & NW		26-32 ft; 11 sec	26-32', 6-7&10-11sec		26-32', 8-11 sec	26-32 ft, 6-7&10-11sec	26-32 ft; 6-7 &9-11 sec	26-32 ft;6-7&9-11 sec	26-32ft;6-7&9-11 sec
ec	8', 9 sec			8 ft; 9 sec	6 ft, 6 sec		8', 9 sec	6 ft, 6 sec	6 ft; 6 sec	6 ft; 6 sec	6 ft; 6 sec
t/sec	2.4-3.1	1.7-2.1	1.3-1.8	2.7-3.5 ft/sec	1.8-2.2	1.6-2.0	2.9-3.8 ft/sec	7.2-9.0 ft/sec	6.6-8.2 ft/sec	3.3-4.1 ft/sec	4.3-5.9 ft/sec
c	0.4	0.2	0.2	0.5 ft/sec	0	0	0.6 ft/sec	0.6 ft/sec	0.4 ft/sec	~0 ft/sec	0.1 ft/sec
c @ 80 ft	1.7 ft/sec @ 80 ft			1.7 ft/sec @ 80 ft	1.7 ft/sec @ 40 ft		1.7 ft/sec @ 80 ft	1.7 ft/sec @ 40 ft	1.7 ft/sec @ 40 ft	1.7 ft/sec @ 40 ft	1.7 ft/sec @ 40 ft
9,000 cy	none known			none known	limited, no trace		none known	6 mil cu yds	175,950 cy	quantity unknown	1,008,700 cy
to coarse Skewness	coarse to med. sand			fine-medium sand	coarse-med sand, gravel		neg. skew sand	fine clayey silt	medium sand	medium sand	very coarse sand
●	●	--	●	●	--		●	--	●	--	●
-	--	--	--	●	●		●	--	●	●	●
●	●	●	●	●	●		●	●	●	●	●
-	--	--	--	--	●		--	●	●	●	●
-	●	--	--	--	--		--	--	--	--	--
-	●	●	--	●	--		--	--	--	--	--
●	●	●	●	●	--		--	--	--	--	--
●	●	●	●	●	●		●	--	--	--	--
-	--	--.	--	--	--		--	●			
-	NY	NY	--	--	NY		--	Conn, NY	Conn	NY	Conn
...a agassizi ...entata ...ia sp ...reis	sparse Bryozoans *Pectinaria gouldii* *Ampelisa agassizi* abundant worms numerous polychaete			dominant amphipods: *Ampelisca agassizi*, *Leptocheirus propinquis*, polychaete worms: *Spiophanes bombyx*, *Nepthys incisa*, *Lumbrinereis tenuis*, mollusc: *Nucula proxima*	limited hydroids *Balanus balanus* burrowing forms absent except *Crangon septemspinosus*		*Pectinaria gouldii* abundant amphipods such as *Unciola irrorata*; *Ampelisca*	*Ampelisca vadorum* *Nucula proxima* *Nephtys proxima* *Pagurus longicarpus*	polychaete worms include *tharyx annulosus*, *Aricidea jeffreysii*, molluscs include *Musculus corrugatus*, *Tellina agilis*, numerous amphipods were *Unciola inermis*, *U. irrorata*	most abundances were of molluscs such as *Astarte quadrans* and *A. castanea*, amphipods dominated by *Protohaustorius wigleyi*, *Nepthys bucera* obtained	*Ampharete acutica*, *Harmothoe extenuata* and a few other polychaetes, *Nassarius trivittatus* *Musculus corrugatus* were some molluscs found, numerous decapods and amphipods were *Phoxocephalus holbolli*, & *Stenopleustes gracilis*
...ckerel, ..., ..., Cod, ...Flounder, ...tuna,	Atlantic mackerel, Pollock, Bluefish, Hoke, Cod, Touting, Flounder, Fluke, Striped bass, Bluefin tuna, Dogfish, Skate, Blueback herring, Scup, Weakfish, Cunner, Goosefish, Pout, Sea raven, Sculpin, Squid, Lobster			Smooth dogfish, Big skate, Little common skate, Blueback herring, American shad, Alewife, Silver Hake, Spotted hake, Fourspot flounder, Winter flounder, Windowpane Butterfish, Bluefish Scup, Weakfish, Cunner, goosefish, Atlantic cod, Ocean pout, Sea raven, Longhorn sculpin, Long finned squid, Lobster, Jonah crab, Ocean quohaug	Bluefish, Striped bass, Pollock, Cod, Mackerel, Winter flounder, Toutog, Cunner, Scup, Blacksea bass, Fluke, Lobster, Shellfish		Winter flounder, Yellowtail flounder, Striped bass, Polloch, Atlantic mackerel, Bluefish, Cod, Tuna, White marlin, Swordfish, Atlantic Bonito, Blacksea bass, Toutog, Cunner, Ocean quodrog	Flounder, Fluke, striped bass, bluefish, Hogshocker, Silverside, Sand lance, Lobster, Quohog, Scallop, Atlantic mackerel, smelt, Glut herring, Menholden, Black sea bass, Skate, Scup Filefish, Cunner, Toutog, Searobin, Butterfish, Rock gunnel, Sculpin, Sea Raven, Grubby, Hoke, Ocean pout	Scup, Striped bass, Bluefish, Winter flounder, Fluke, Bay quohaug, Oyster, Lobster, Known species list is 52	Lobster, Shad, Black sea bass, Cod, Toutog, Flounder, Scup, Mackerel, Striped bass, Bluefish, Pollock, Cunner, Fluke	Oyster, Lobster, Shad, Mennaden Alewife, Scup, Flounder, Total species list assumed to be approximately 100.

FIG. 6 -21

2

characteristics. It would be a place where the residence time of the deposited material would be infinite; none of the sites discussed truly meets this criterion although many of them nearly do. (Analysis indicates that at three sites the materials would be widely dispersed, with essentially no local containment; these will be eliminated from the comparative rating process.) It would be large enough to accept all of the dredge spoil which might reasonably be expected to be generated within plausible haul distance, for many years to come; most of the sites considered here actually meet, or come close to meeting, this condition. It would be an area of no biological activity, and it would preferably be located in the midst of an extended area of no or slight biological value; no site discussed meets this condition. The ideal site would have no value for use as a fishery. In fact, it would have no known or expected use at all. None of the sites are so valueless. It would be a site where regulatory interest would provide for controls to insure against environmental harm. Finally, it would be so close to the proposed dredging activity as to make the costs of transport of the material immaterial; the New London Dumping Ground comes close to satisfying this particular requirement, but even there some transport cost for the spoil material must be accepted.

6.362 Since no site can be found which will meet the ideal criteria, the available sites must be compared. This means that each must be ranked in terms of relative suitability for each element that must be considered in the final decision process. This is done below. Suitability for spoil disposal was ranked as excellant, good, fair,

or poor and represented numerically as one through four. In addition, some weight must be attached to the importance (in terms of meeting the intentions of NEPA) of each element so considered, since it is almost certain that all elements are not equal. An attempt at such weighting has been made, and the results are presented in the site ranking matrix of Figure 6-22. This is not to be considered decision-forcing; it is intended, rather, to illuminate the key issue involved in the final decision process and to allow a choice to be made in the light of knowledge as to the expected consequences of such choice. A choice so made is responsive to the requirements of NEPA; one made by any other process is subject to criticism on the grounds that it is not.

6.363 Retention Ability. Paragraphs 3.57-3.67 and 6.196-6.360 have discussed the various elements that have been reviewed with reference to the fourteen sites under consideration. It now becomes necessary to put that information in a form which will allow for site comparison and evaluation. The review pointed out that a primary requisite for a desirable site would be its ability to contain the dredge spoil. It was thus necessary to determine which of the sites were in fact containment sites and which would have to be designated as dispersal. To accomplish this separation, the primary factors considered were the prevailing bottom velocities and sediment characteristics. Four of the sites emerge as clearly in the containment category; the New London Site; Browns Ledge, and Containment Sites 1 and 2. Five of the sites are at least marginal containment sites; the Rhode Island

Sound Site, the Acid Barge Site, the Munitions Site, East Hole, and the Niantic Site. Available evidence suggests that the remaining six sites are dispersal in character ("Containment" Site 3, West Hole, the Orient Point Site, the Cornfield Shoals Site and Dispersal Sites 1 and 2). The preferred ranking (1 on a scale of 1 to 4) was given to the New London Site. Containment properties of the site are noted in the monitoring reports in sections dealing with sediment, which is composed of clayey silt with some coarser material and appears to be stable. The bottom velocity of 1.7 feet per second is as low as at many of the sites which do or may have containment characteristics.

6.364 Ranked second was Containment Site 2 which has a bottom velocity of 1.1 feet per second, but also has sediments that are silty sand to coarse silt with positive skewness.

6.365 A second place ranking was also given to Containment Site 1 which, even though it has a lower bottom velocity (0.7 feet per second) than Containment Site 2, is much shallower. The sediment characteristics of coarse silt with positive skewness support the containment designation.

6.366 Browns ledge was also in the group ranked second. Even though it has low bottom velocities (0.9 ft/sec), it is more exposed to waves than other sites and has a sand substrate, suggesting less certain containment of Thames River sediments than higher ranked sites.

6.367 Of the five marginal containment sites, East Hole offered the best containment possibilities and was ranked in the third group. Its

bottom velocity of 1.2 feet per second, coupled with positively skewed sediments, are responsible for its favored position among the marginal sites.

6.368 The Munitions Site and the Acid Barge Site were the next most preferable of the marginal sites. Third rank was assigned to both of these sites.

6.369 The fourth marginal containment site, and in the fourth rank, is the Rhode Island Sound Site. The site has a bottom velocity of 1.2 feet per second. The spoil remaining at the site is silty, but there is a capping layer of harder material. The origin of the capping layer is a question. It may be lag sands resulting from winnowing of the finer material and, thereby, indicating dispersal characteristics. On the other hand, it may be estuarine sands that are being transported to the site from elsewhere.

6.370 The Niantic Site, although used for past spoil disposal, has tidal currents of about 2.5 feet per second and a bottom composed of clean sand. It is clearly the least preferable of all nine sites and was assigned a ranking value of four.

6.371 The six other sites are clearly dispersal in nature and because of that characteristic will be eliminated from the following ranking procedure. This elimination is responsive to the general lack of knowledge of the fates of dispersed contaminants in the marine environment. In containment sites, the materials may be monitored and could

actually be removed, if required. In dispersal sites, the materials must be considered "lost" once deposited.

6.372 "Containment" Site 3 in fact turns out to have been misnamed since its characteristics are clearly dispersal. Locations A and B have tidal velocities of 2.6 knots, and location C (also called "West Hole") has a somewhat slower tidal velocity; but all three locations exhibit the same sediments. Coarse to medium sand with small pebbles are the prevailing sediment constituents. Dispersal Site 1 (the Race) has tidal velocities of 2.2 knots and sediments of coarse to medium sand and gravel. Essentially the same conditions were obtained at the Orient Point Site, just west of Plum Gut.

6.373 Dispersal Site 2 (the Block Island Channel) has tidal velocities of 2.5 knots and may be subject to density currents. The sediments are moderately well sorted sand with a negative skewness.

6.374 The Cornfield Shoals Site, as discussed earlier, has been used only as a disposal site for clean granular materials. This, combined with swift bottom currents, forces a dispersal designation for the site.

6.375 In all six of these latter cases the absence of the finer grain sizes in the sediments combined with tidal velocities is sufficient to support the case for dispersal designation.

6.376 Containment Capacity. The potential capacity of a disposal site to accept dumped spoil is not a critical element in ranking sites in terms of their acceptability, but it should be considered. In this case

the capacity of most of the disposal sites under evaluation to accept spoil deposits far exceeds the requirements of the Thames River dredging contemplated by the Navy. Most can also accept all of the spoil that can reasonably be expected to be generated by projects in the region (between the Connecticut River and Narragansett Bay) between 1975 and 1985. However, at some sites the latter would come closer to "filling" the site potential than at others. The theoretical capacity of the containment sites was determined by assuming that they were filled to the greater of: the depth at which common waves generated a bottom velocity of 1.7 feet per second (the erosion velocity of Thames River sediments), navigation depth near harbor mouths (assumed to be 40 feet), or the depth necessary to fill a natural hole (150 feet at East Hole). These fill capacities must be viewed as comparators, rather than absolute limits, since increasing the size of the dump site or selecting other limiting depths could yield much greater or lesser capacity for any of the sites.

6.377 On this basis, the sites range from a maximum theoretical capacity of 164 million cubic yards (the Munitions Site) to 34 million cubic yards (Containment Site 1). The order of preference is from largest to smallest: Munitions Site and Acid Barge Site ranked first; Niantic and East Hole ranked second; Containment Site 2, New London and Browns Ledge ranked third; the Rhode Island Sound Site and Containment Site 1 ranked fourth.

6.378 Site Biology. The site ranking of benthic fauna and fish (finfish, lobster, shellfish) is based on a numeric scale of 1 to 4 in term

of increasing diversity and contribution to fish resources. Therefore the site with the lowest rank is also the one with the lowest diversity and therefore the most desirable for spoil disposal. In this ranking process, positions were determined first on infaunal and epifaunal diversity, second on fisheries and other biological information, and finally on estimates of biological stability, as indicated by physical conditions and biological diversity. This represents a very simplistic judgement for a complex system. Nonetheless, the following discussion presents the reasons for assigned values. It must also be mentioned that values are based on not only the specific site, but its environs as well.

6.379 The New London Site is in relatively early stages of recolonization where opportunistic species rapidly reproduce and colonize. In spite of moderate to high densities of amphipods, the epifaunal and infaunal communities at the New London Site are not as stable as at other sites. Therefore New London has been given first ranking, implying lower diversity and ecosystem stability.

6.380 When compared with the New London Site the benthic Shannon-Weaver species diversity of the East Hole site is actually lowest and was ranked first. For fish species diversity, it was ranked second, for a combined ranking of first.

6.381 The proposed Munitions Site has been ranked third for the biological category. This location received a moderately high ranking for infauna diversity (conservatively assigned due to lack of information)

however it was ranked lowest for fish with the net result of ranking second.

6.382 Inasmuch as the Rhode Island Sound Site is still going through the process of recolonization, it appears to be approaching a stage where the rapidly reproducing and colonizing species such as Ampelisca are being replaced by slower reproducing but more stable biota. This site ranked second for infaunal species diversity and third for fish, with a net rank of two.

6.383 Because of its shallower depth, proximity to physical and chemical perturbations, and apparent inability to sustain a high fish yield, Containment Site 1 is also ranked second.

6.384 The proposed Niantic Site has been ranked as third. Of the four proposed sites on which Shannon-Weaver species diversity data for benthic infauna were available, the Niantic site had the highest species diversity. Therefore the site was ranked fourth for benthic infauna; however, it was ranked third for fish and consequently came out third for the combined biological category.

6.385 Containment Site 2 is deep, far from rivers and land, has a flat bottom, appears to be physically stable, and supports a high yield of finfish and shellfish. Available benthic data indicates moderate species diversity. Therefore, it has been ranked fourth.

6.386 Browns Ledge is also ranked in the fourth group. Although Shannon-Weaver diversity quotients were not available for the benthic data,

over 120 species of invertabrates are known to inhabit this site; therefore it was ranked fourth. Fish ranking was also fourth, and the combined biological rank was four.

6.387 The Acid Barge Site has also been assigned the highest rank for benthic species diversity. This is based more on an intuitive process than on field data. However, research in other areas suggests a higher species diversity (with lower density) in more geologically stable environs. This would suggest reasonable biological stability at this site. Additionally, the presence of clean sand also suggests the presence of surf clam, which has characterized benthic communities of very high productivity (ref. 174). The Acid Barge Site is also heavily trawled for finfish and appears to sustain a high yield.

6.388 Fishing. As a more direct evaluation of human use of biologic resources, each site has been ranked for its use for sport fishing and commercial finfish, lobster, and shellfish harvesting.

6.389 Commerical fishing effort and yield between 59° and 72° west longitude is low. The Munitions Site is located in between these points and is accordingly ranked lowest for fish harvest, hence first for suitability as a disposal site.

6.390 The New London Site has also been ranked first for site use and value, in its present context. Part of this is due to the proximity to more favorable areas for sport and commercial fisheries, such as Fishers Island Sound and the Race. Nevertheless, catch information in-

dicates the contribution by this area to the regional catch is lowest.

6.391 Some trawling, and limited shellfishing takes place at East Hole. The physical characteristics of the site however appear to limit the actual commercial fishing of this site. East Hole has therefore been ranked second for commercial and sport fishing use.

6.392 Containment Site 1 has been ranked second as well. While yield of fish from this site is not known, there is trawl and trap net fishing in the area.

6.393 Because of the floating trap fishery, lobster fishery, moderate to heavy trawl fishery, some shellfish harvesting, and sport attraction, the Rhode Island Sound Site has been ranked as third in the line of increasing contribution to commercial and human use values.

6.394 The Niantic Site has been ranked in the third group for commercial and sport fishing uses and value. Trawling for finfish and lobstering is reported for the site itself as well as surrounding and nearshore areas. Nearby sportfishing areas are favored and shellfish harvesting is reported in Niantic Bay and coastal regions.

6.395 Because of its value as a favored lobstering, finfishing, and sportsfishing area, Browns Ledge has been ranked fourth.

6.396 Containment Site 2 is also ranked in the highest group. This area is located in and adjacent to finfish trawling areas, shellfish harvesting beds, and lobstering areas. Any or all of these activities contributes

a high income to ports where the harvests are landed.

6.397 Based solely on its yield of finfish, the Acid Barge Site has been ranked highest in value. The high ranking also reflects lack of other information as to value and use.

6.398 Site Use (Other Than Fishing). The assumption has been made that any use of one of these sites which would either be interfered with or preempted by the dumping of dredge spoil is a detracting factor in evaluating the merit of that site as a dumping area. The biology of the site has as a direct ramification the use of the site as a fishing ground. Fishing, then, as a human use has already been considered. Keeping in mind that the sites are ranked on the basis of their desirability as dumping sites, that site which has the least "other" conflicting uses would receive the lowest ranking (1 on a scale of 1 to 4).

6.399 The New London site has been given the most favorable ranking based on its recent history as a dumping ground and the absence of any other conflicting activity.

6.400 The second most desirable was given to Rhode Island Sound Site which has a history of recent dumping even though it is somewhat more limited than that at New London. Niantic is also ranked second for similar reasons.

6.401 There is no known activity other than perhaps limited fishing at the Munitions Site. The Acid Barge Site and Browns Ledge are

are somewhat more heavily fished. Although there is no activity on Containment Site 1, its proximity to the submarine anchorage area was sufficient to place it in this group of four sites which all received a third place ranking.

6.402 The least desirable sites, both in the Block Island-Fishers Island Acoustic Range, are East Hole and Containment Site 2.

6.403 Regulatory Requirements. A rating factor was established in this category in an acknowledgement of the larger scope of effort required by regulatory bodies in designation of dredge spoil disposal sites. In addition to the effects on ecology at a given location, the regulatory agency, in the public interest, must consider factors ranging from possible maritime hazards to fair consideration of the bonafide interest of the federal agencies, commissions, and others who are affected by the selection process.

6.404 The rights and interests of states, municipalities and private groups must be fairly evaluated. In the search for sites which will accommodate dredging spoil in the area of the Long Island Sound, there has been an intensive effort, spearheaded by the Corps of Engineers for the past several years, to bring the various concerned agencies into agreement on the location of sites which provide a realistic balance of all appropriate considerations . . . . social, economic, ecological, and legal. The proper measure under this rating category, in recognition of the long periods of time required to obtain agreement of many diverse groups and the economic consequences to extend delay of dredging

projects, should be the degree of coordination achieved, the investment in committed safeguards, (monitoring programs) and the extent and reliability of the information currently available from the safeguard programs.

6.405 Rated in this fashion, the New London site and the Rhode Island Sound Site are the first choices. Both are operated in compliance with State as well as Federal laws, and both are or have been accurately monitored. Second rank is assigned to Browns Ledge, which lies in waters claimed by Rhode Island and Massachusetts. If Browns Ledge were to receive dredge material from the Thames River (Connecticut), administrative coordination with Rhode Island and/or Massachusetts would become necessary. While the coordination that has thusfar been achieved at Browns Ledge is to some degree a result of controversy, administrative processes which will lead to its ultimate designation or rejection as a disposal site are being identified and must be recognized before making a final decision.

6.406 The Niantic Site, in Connecticut waters is ranked third, as is Containment Site 1 in New York. Neither of these sites has been actively considered for permit action other than in tentative engineering studies, and consequently, little if any of the administrative coordination that would be required among the concerned Federal and State Agencies has been accomplished.

6.407 The remaining four sites do not lie within the waters of any State, and from a regulatory stand point, would require less coordination

to designate. (Essentially, the coordination would be between the Corps of Engineers and the EPA). The significant disadvantage of these sites is the current lack of information available as to their characteristics and suitability as disposal sites, and the difficulty and expense in obtaining such information. Of the four sites, the East Hole is under consideration as an alternate to the New London Site. However, there is no ongoing monitoring program at the East Hole and since several years of monitoring are necessary to establish a meaningful data base, the development and implementation of such a program at this site would require a substantial investment. Consequently each of these four remaining sites are assigned fourth rank.

6.408 Cost. Three factors enter into assignment of a rating factor for cost at disposal sites under consideration. These are: haul distance to the site; location of the site in the open ocean or more protected inland waters; and monitoring which is affected by the existance or non-existance of base line data from previous monitoring at the site. Of these, haul distance tends to be the most significant. Viewed in this light, the most desirable sites in terms of cost are New London and Niantic; these are close to the area to be dredged, lie in inland waters, and have been subject to fairly intensive recent monitoring efforts. Accordingly, these two sites are rated as 1 in the evaluation matrix. Containment sites 1 and 2 and the East Hole all lie within inland waters and are fairly close to New London; there is no body of formal baseline monitoring data for any of them, although East Hole has been sampled sporadically. They have been assigned a rating of 2 for evaluation purposes, although

it should be noted that costs for Containment Site 2 would be greater than for the other two sites in this group. Ranked as group 3 are the Rhode Island Sound Site and Browns Ledge Sites. These lie in inland waters and have been subject to fairly intensive recent monitoring; however, the distances from New London are considerably greater than for sites rated 1 or 2. The Acid Barge Site is also assigned a rating of 3. Its open water location adds to disposal and monitoring costs, and there are no baseline monitoring data. However, the relatively short haul distance makes total costs comparable to those at Browns Ledge. Finally, the Munitions Site is assigned a rating of 4. It lies in open waters, adding to both transportation and monitoring costs; the distance from New London is large; and there are no baseline monitoring data.

6.409 Comparative Site Evaluation. In paragraphs 6.359 through 6.420 the nine "containment" sites have been ranked parametrically with respect to their suitability for use in dredge spoil disposal. The final step is to consolidate these judgements in order to reach some qualitative estimate of the relative merits of the nine remaining candidate ocean disposal sites. (As noted earlier, the pure "dispersal" sites were eliminated from consideration in this ranking process).

6.410 The results of the analysis are presented in Figure 6-22. They were arrived at as follows. First, for each parameter, the relative suitability of each site was assigned the corresponding number rating from 1 to 4. These appear above the diagonal line in each box of the matrix

of Figure 6-22. Next, each parameter was assigned a weighting value. These range from a high of 30% for spoil retention to a low of 5% for site capacity and costs. The distribution of the weights is such that, for the seven parameters listed they total 100%. These weighting factors were then converted into multipliers for individual raw scores, with the results shown below the diagonal line in each box of the matrix. Thus, the raw score for "Retention" was multiplied by six, while that for "Cost" was multiplied by one for each site. Finally, the raw scores and the weighted scores are summed and the resulting site ranking is displayed. It will be noted that the weighting factors selected result in a number of changes in assigned rank order. The reason for and implications of these changes will be discussed later in this Section. The highest possible weighted score is 80 and the lowest is 20. The lower the weighted score, the more suitable the site.

6.411 It must be stressed that this process is artificial in nature. While it does provide guidance toward reaching an informed judgment about the relative suitability of the several sites. It should not be considered as definitive in nature. There are several reasons for treating the results with caution.

6.412 The assignment of suitability reflects the ranking order as accurately as could be determined, but it does not reflect actual values accurately. For example, disposal costs are least at the New London Site and greatest at the Munitions Site, but the latter are

	Retention	Capacity	Biology	Fishing	Other Uses	Regulatory	Cost	Summation	Rank Order
% Relative/ Weighting Importance/ Factor	30/6	5/1	20/4	15/3	15/3	10/2	5/1		
BROWNS LEDGE	2/12	3/3	4/16	4/12	3/9	2/4	3/3	21/59	4/6
RHODE ISLAND SOUND	4/24	4/4	2/8	3/9	2/6	1/2	3/3	19/56	3/5
ACID BARGE	3/18	1/1	4/16	4/12	3/9	4/8	3/3	22/67	5/9
MUNITIONS	3/18	1/1	2/8	1/3	3/9	4/8	4/4	18/51	2/3
CONTAINMENT 1	2/12	4/4	2/8	2/6	3/9	3/6	2/2	18/47	2/2
CONTAINMENT 2	2/12	3/3	4/16	4/12	4/12	4/8	2/2	23/65	6/8
EAST HOLE	3/18	2/2	1/4	2/6	4/12	4/8	2/2	18/52	2/4
NEW LONDON	1/6	3/3	1/4	1/3	1/3	1/2	1/1	9/22	1/1
NIANTIC	4/24	2/2	3/12	3/9	2/6	3/6	1/1	18/60	2/7
CONTAINMENT 3	NA	NA	NA	NA	NA	NA	NA	NA	NA
WEST HOLE	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISPERSAL 1	NA	NA	NA	NA	NA	NA	NA	NA	NA
DISPERSAL 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIENT POINT	NA	NA	NA	NA	NA	NA	NA	NA	NA
CORNFIELD SHOALS	NA	NA	NA	NA	NA	NA	NA	NA	NA

SITE EVALUATION MATRIX **FIG.6-22**

not exactly four times as great as the former, and so on for the other parameters considered. A more precise determination might consider the relative importance of each parameter at each site in relation to some fixed standard. This might lead to raw scores for a given parameter's being distributed among the nine sites in some such fashion as 1, 2.5, 3.6, 4, instead of 1, 2, 3, 4. Here they decision was made to adopt the simpler, but possibly less sensitive, method because of the great difficulty of reaching an accurate determination of such relative values. The available information was sufficient to support a pure rank-order judgement; it was not adequate to justify assignment of numerical ratings that would precisely reflect marginal differences in a given parameter from one site to another. Hence, the "raw score" summations and site ranking are accurate within the limits imposed by available data, even though they are at the least somewhat insensitive to small differences.

6.413 The analysis also avoids the fallacy common in such assessments of making each factor equal in weight to each other. However, the weighting values actually used reflect value judgements, and a shift in relative importance accorded different parameters could affect the final weighted scores and site rankings.

6.414 Here the greatest assigned weight (30%) was placed on the expected retention capability of the site. The rationale for this decision was that the theory of employing a "containment" site rests on the postulate that any deleterious impacts from spoil disposal

will be confined to a limited area; if some of the material is actually lost through dispersion, the impacts of disposal may be felt at considerable distances from the spoiled area.

6.415 Site capacity was considered of low importance, leading to a 5% weighting. All sites could accept all spoil to be generated in the study area through 1985, let alone the Navy's Thames River dredging project spoil. However, in some cases the total site capacity was clearly greater than in others, and the post-disposal depths also varied.

6.416 Biological factors, based on the characteristics of benthic animal populations, were considered as key indicators of "environmental health" of the site and directly related to human use for fishing (either current or potential). Accordingly, this parameter was weighted heavily at 20%.

6.417 Harvesting of finfish and shellfish, both commercially and for sport, is one of the chief uses of the study area and one which might be adversely impacted by spoil dumping, hence the assigned weighting of 15%. It is recognized that the biological and fishing parameters are inter-related and that the treatment accorded them here could be considered double counting. However, it will be noted that the raw scores for these two parameters do not exactly coincide; in view of this, and of the great environmental and economic importance of maintaining in an unimpaired state both existing fisheries and the ecological conditions necessary for the continued support of fish

populations, the dual consideration was adopted.

6.418 Other human uses of the candidate sites, such as research or military operations for example, were lumped together under the parameter "Other Uses". The value of 15% was felt to reflect a reasonable estimate of the value of such activities in relation to other parameters that must be considered.

6.419 "Regulatory" considerations were, as noted earlier, rated on the basis that the greater the known regulatory interest (which would lead automatically to close control over, and monitoring of, disposal operations) the less danger of environmental damage. The question of regulatory impacts, however, was not considered of crucial importance, and the assigned weight is only 10%.

6.420 Finally, "Cost" was assigned a weighting of only 5%. Cost must always be taken into consideration, but as a rule it should only govern in the event that all other factors are equal. In general, the ranking of parameters on a site-by-site basis does not reflect such uniformity. However, the high preference afforded the distant Munitions Site and the low preference given to the close-by Niantic Site in the weighted rankings suggested that the element of cost might not have been given due consideration. Accordingly, an additional sensitivity analysis of cost impact on site preference was performed. The results of this analysis are presented in Table 6-11.

6.421 The four columns of Table 6-11 show site rank order in terms

TABLE 6 - 11

SENSITIVITY ANALYSIS OF COST IMPACT ON SITE PREFERENCE

Rank Order	Sum of "Raw" Scores	Cost as 5% of Evaluation	Cost Not Considered in Evaluation	Cost Set Equal to All Other Factors
1	New London	New London	New London	New London
2	* Niantic	Containment 1	Containment 1	Niantic
3	* East Hole	Munitions	Munitions	Containment 1
4	* Containment 1	East Hole	East Hole	East Hole
5	* Munitions	Rhode Island Sound	Rhode Island Sound	Containment 2
6	Rhode Island Sound	Browns Ledge	Browns Ledge	Rhode Island Sound
7	Browns Ledge	Niantic	Niantic	Browns Ledge
8	Acid Barge	Containment 2	Containment 2	Acid Barge
9	Contaiment 2	Acid Barge	Acid Barge	Munitions

*In any column, sites marked with asterisks are of equal preference.

of: "raw score" for each parameter considered; weighted score using the importance factors discussed immediately above; preference when "environmental" parameters alone are considered with cost completely eliminated; and, finally, ranking with cost set equal in weighting value to all other elements. The Table reveals that the New London Site is the preferred site and the Acid Barge Site a poor choice no matter what weighting is given to cost in the decision process. (This reflects the item-by-item ranking for these sites as shown in Figure 6-22.)

6.422 Similarly, Containment Site 1 appears as a strong candidate site and Browns Ledge as a somewhat weak candidate, irrespective of cost considerations. On the other hand, certain sites change relative position markedly as weighting factors are altered. This phenomenon is most clearly shown for the Niantic and Munitions Sites.

6.423 The "raw score" ranking shows four sites tied for second place. The Munitions Site score reflects its high degree of suitability from an environmental point of view in spite of costs, which are greater here than for any other site. For the Niantic Site, cost is a trivial element, but assigned rankings for such environmental parameters as Retention, Biology, and Fishery are relatively high. The results of weighting according to the chosen set of importance values are shown in the second column. The Munitions Site is third in order of preference and the Niantic Site is seventh.

6.424 The third column reveals that the low assigned weighting factor

given costs has indeed influenced the final ranking. Here costs are entirely eliminated from consideration. Columns two and three are almost identical. In particularly, the Niantic and Munitions Sites are not affected. This suggests that from a purely "environmental" point of view the Niantic Site is a poor choice for spoil disposal, while the Munitions Site is highly acceptable.

6.425 However, costs must be considered as well. Use of the Munitions Site would probably entail from three to five times the expenditures associated with use of close-in sites such as New London and Niantic. In the fourth column of Table 6-11 Cost is given a very high weighting; it is set equal in importance to all other factors combined. This brings the Niantic Site up from eighth place to second and drops the Munitions Site from second to ninth. Other changes in ranking, however, are not of great significance.

6.426 The foregoing analysis suggests that the ranking derived from use of the chosen weighting factors reflects the totality of considerations which must be taken into account in choosing a disposal site for Thames dredging spoil rather well, even including cost, save for the Munitions Site. Use of this site would be so costly, in comparison to other available alternatives, as to assign it a low preference, even though the expected impact upon the environment would be small. On the other hand, the savings in costs that might be realized by use of the Niantic Site appear not to be sufficient to justify its selection. The expected environmental impacts would

be relatively large, and there are at least three other potential sites (New London, East Hole, and Containment 1) which would be preferable from an environmental point of view and where costs would be less or similar.

7. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

It is not envisioned that unavoidable adverse environmental effects associated with the proposal, viz., dredging of the areas indicated in paragraphs 2.04 through 2.07 and disposal in offshore waters, differ greatly from those impacts mentioned in Section 4 of the FEIS. Although the impacts associated with dredging are unavoidable, the ongoing monitoring program at New London has shown these impacts to be minimal and short term (see Appendix B).

8. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

These factors as they pertain to dredging and disposal in offshore waters are described in the FEIS., paragraphs 6.01 through 6.04.

9. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible and irretrievable commitments of natural resources as concerns dredging and spoil disposal are presented in Section 7.01 of the FEIS.

10. CONSIDERATIONS THAT OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS

As stated in Section 1.20 of the FEIS, the determination to utilize

the facilities at the NAVSUBASE for the development of the new 688 Class nuclear powered submarines has been made by the Secretary of the Navy. The implementation of the subject projects will enable the Navy to provide adequate berthing and drydocking for the new submarines thereby meeting its programmed commitments to the National Defense.

11. RATIONALE FOR PERMIT ACTION

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASSACHUSETTS

11.01 PURPOSE. The material in this section is provided to make the FEIS comprehensive from the standpoint of relating actions by the Corps of Engineers in its regulatory capacity under the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and the Marine Protection, Research and Sanctuaries Act of 1972 (PL 92-532). It is intended to supplement the FEIS by way of (1) providing background information for the original permit decision (see paragraph 1.07), and (2) providing the rationale for further permitting actions being considered.

11.02 BACKGROUND. The discussion and record in Appendix L provide an insight to the long and arduous process of searching for the public interest where disposal of dredge material is concerned. The sorting and weighing of values follow no predetermined paths, for none existed then, nor today, four years after first deliberations began. The selection of the New London Dumping Ground was based on value judgments of all factors available at that time.

11.03 CURRENT PERMIT ACTIONS. The permit issued in 1974 has been suspended in response to the Court's ruling (see paragraphs 1.15, 1.16), and its issuance for continuation of the work must be reconsidered in the light of that decision. The Navy has since requested that additional work be permitted. The additional work would increase

the volume of material to be dredged and relocated from an initial 2.8 million cubic yards to approximately 3.4 million cubic yards.

11.04 A primary question arises as to whether the additional work proposed by the Navy under its long range plan for the New London facility should change the decision factors that were present at the time of the original permit action, i.e., whether or not additional volumes should affect the site selection criteria or disposal area management situation. It is the judgment of the Corps of Engineers, based on physical data available, that the additional work specified is not of itself of sufficient magnitude to constitute an over-riding constraint on this decision.

11.05 The Corps of Engineers in considering the reissuance of the original permit including the permitting of additional work has applied, in accordance with its regulations (33 CFR 209), the "Environmental Protection Agency Interim Regulations on Discharge of Dredged or Fill Material into Navigable Waters" (40 CFR 230) to the proposed disposal site, i.e., the New London Dumping Ground, as follows:

NOTE: The ecological evaluation which follows is presented in the format of 40 CFR 230 (See Appendix C).

§230.4-1 <u>PHYSICAL AND CHEMICAL-BIOLOGICAL INTERACTIVE EFFECTS</u>

(a) PHYSICAL EFFECTS

(1) <u>Degradation or Destruction of Aquatic Resources by Filling Operations in Wetlands</u>.

Wetlands, as defined in the "ENVIRONMENTAL PROTECTION AGENCY STATEMENT OF POLICY ON PROTECTION OF NATION'S WETLANDS" (38 CFR 10834 of March 20, 1973) are not affected by the proposed action.

(2) Effects on the Water Column.

"The significance of water column physical effects are not readily predicted by Current Technical Approaches (40 CFR 230)." See paragraphs 5.42, 5.47, 5.52, 5.54, 5.55.

(3) Effect on Benthos.

See paragraphs 5.43, 5.44, 5.51, 5.57, 5.58.

(b) CHEMICAL-BIOLOGICAL INTERACTIVE EFFECTS

(1) Evaluation of Chemical-Biological Interactive Effects.

The material to be dredged may not be excluded from evaluation procedures specified in paragraphs (b)(2) and (3) of this section.

(2) Water Column Effects.

The elutriate test as described in this section was not conducted on either the original or the additional material to be dredged due to the absence of these regulations (40 FR 41291, September 5, 1975) at the time sediments were tested. The Navy did accomplish those tests required by the "Environmental Protection Agency Criteria for Evaluation of Permit Application for Ocean Dumping," (40 CFR 227) which were in effect for navigable waters until issuance of 40 CFR 230. See paragraphs 3.15, 3.16 and Appendix H.

(3) Effects on Benthos.

See Appendices B and H.

(c) PROCEDURE FOR COMPARISON OF SITES

(1) Total Sediment Chemical Analysis.

See paragraphs 3.15 - 3.38, 3.47 - 3.56 and Appendix H.

(2) Analyses of Biological Community Structure.

See paragraphs 3.39 - 3.46.

§230.4-2 WATER QUALITY CONSIDERATIONS

Since the New London Dumping Ground lies in the "internal" waters of both the state of New York and the state of Connecticut, water quality standards for these two States must be considered. The mixing zone (§230.5(e), 40 CFR 230) is considered to be a 3.14 square mile circular area as delineated in criterion "J" amended to U.S. Army Corps of Engineer permit CT-LOND-74-63.

State of Connecticut Department of Environmental Protection Water Quality Standards (approved November 30, 1973)

State of Connecticut coastal and marine waters in Long Island Sound outside shellfish closure lines from Connecticut - New York state line to Connecticut - Rhode Island state line - are classified 5A, i.e., suitable for all seawater uses including shellfish harvesting for direct human consumption (approved shellfish areasI, bathing and other water contact sports.

New York Classifications and Standards (Parts 700-703, Title 6, Official Compilation of Codes, Rules and Regulations, amended February 21, 1974; September 20, 1974)

State of New York saline surface waters in the vicinity of the New London Dumping Ground are classified as 5A, i.e., the waters shall be suitable for shellfishing for market purposes and primary and secondary contact recreation.

The monitoring program that was initiated [at the dredge site and at the New London Dumping Ground] under the conditions specified in the intitial permit was more detailed and comprehensive than any known similar effort that has been undettaken to date. The reports, issued on a quarterly basis, show that monitoring criteria established for the sites have not been violated during the first phase of disposal operations, indicating acceptability of the site within criteria limits.

A comparison between New York and Connecticut Water Quality Standards is indicated in Table 11-1.

§230.5 SELECTION OF DISPOSAL SITES AND CONDITIONING OF DISCHARGES OF DREDGED OR FILL MATERIAL

(a) GENERAL CONSIDERATIONS AND OBJECTIVES

(1) Need for the Proposed Activity.

Justification for the New London project is based on National Defense requirements. This has been accepted as an estab-

TABLE 11-1
STATE WATER QUALITY STANDARDS

ITEM	CT SPECIFICATION	NY SPECIFICATION	MEASURED EFFECTS AT NEW LONDON DUMPING GROUND
Dissolved oxygen	Not less than 6.0 mg/l at any time.	Shall not be less than 5.0 mg/l at any time.	Dissolved oxygen values were observed to decrease in the vicinity of a dump but returned to ambient immediately following disposal. (See p. 5.52 and Appendix B).
Sludge Deposits - solid refuse, floating solids, oils and grease, and scum	None allowable.	---	No such effects were observed at the disposal site. (See p. 5.50 - 5.52).
Garbage, cinders, ashes, oils, sludge or other refuse	---	None in any waters of the marine district as defined by Environmental Conservation Law (Note 1).	No such effects were observed at the disposal site. (See p. 5.50 - 5.52).
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance or construction activity provided all reasonable controls are used. (Note 2)	---	The ongoing monitoring effort at the disposal site has not detected an adverse environmental effect at the disposal site. (See Appendix B).

TABLE 11-1 (continued)

ITEM	CT SPECIFICATION	NY SPECIFICATION	MEASURED EFFECTS AT NEW LONDON DUMPING GROUND
Suspended, colloidal or settleable solids	---	None from sewage, industrial wastes or other wastes which will cause deposition or be deleterious for any best usage determined for the specific waters which are assigned to each class.	The ongoing monitoring effort at the disposal site has not detected an adverse environmental effect at the disposal site. (See Appendix B).
Oil and floating substances	---	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor glabules of grease.	No such effects were observed at the disposal site during the first increment of channel dredging. Future disposal operations may release minimal quantities of oil; however, the impact should be short-term. (See p. 5.55).
Color	None other than of natural origin except as may result from normal agricultural, road maintenance or construction activity provided all reasonable controls are used. (Note 2) A Secchi disc shall be visible at a minimum depth of 1 meter, SA_B - criteria may be exceeded. (Note 3)	None from man-made sources that will be detrimental to anticipated best usage of waters.	No such effects were reported at the disposal site. (See Appendix B).

TABLE 11-1 (continued)

ITEM	CT SPECIFICATION	NY SPECIFICATION	MEASURED EFFECTS AT NEW LONDON DUMPING GROUND
Turbidity	None other than of natural origin except as may result from normal agricultural, road maintenance or construction activity provided all reasonable controls are used. A Seechi disc shall be visible at a minimum depth of 1 meter, SA_B - criteria may be exceeded.	No increase except from natural sources that will cause a substantial visible contrast to natural conditions. In cases of naturally turbid waters, the contrast will be due to increased turbidity.	Turbidity effects were observed to be a short-term event. (See p. 5.52).
Coliform Bacteria	Not to exceed a median MPN of 70 and not more than 10% of the samples shall ordinarily exceed the MPN of 230 for a 5-tube decimal dilution or 330 for a 3-tube decimal dilution. (Note 4)	The median MPN value in any series of samples representative of waters in the shellfish growing area shall not be in excess of 70 per 100 me.	Monitoring of coliform bacteria has indicated that the Thames River discharge may be causing a greater impact on the disposal site than the dredge spoil. (See p. 5.59).
Taste and odor	None allowable	---	None observed.
pH	6.8 - 8.5	The normal range shall not be extended by more than 0.1 pH unit.	No effects were observed.

TABLE 11-1 (continued)

ITEM	CT SPECIFICATION	NY SPECIFICATION	MEASURED EFFECTS AT NEW LONDON DUMPING GROUND
Allowable temperature	Not applicable.	Not applicable.	None observed.
Chemical constituent/ toxic wastes and deleterious substances	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same for any other uses.	None in amounts that will interfere with use for primary contact recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.	Other than the localized impacts observed at the disposal site, no adverse environmental effects have been reported as concerns the health of man or the fisheries resources. (See Appendix B).

Note 1 - "Marine district" shall include the waters of the Atlantic ocean within three nautical miles from the coast line and all other tidal waters within the state, except the Hudson river northernly of the south end of Manhattan Island.

Note 2 - Reasonable controls may be defined by the Commissioner on a case by case basis or the Commissioner may require that it be affirmatively demonstrated by any person or municipality engaged in such activities that all reasonable controls will be or are being used.

Note 3 - The use of subscript b in Class Bb is intended to identify those areas where natural conditions or conditions which cannot be expected to be appreciably altered by the control of discharges may preclude bathing. It may also be used in Classes Bb and SBb to designate areas in the immediate vicinity of treated sewage outfalls where bathing is not advisable.

TABLE 11-1 (continued)

Note 4 - Coliform bacteria criteria are intended to provide a standard for coliform data evaluation and are related to the probability of contamination by undisinfected sewage. High results may be due to soil bacteria or bacteria from the feces of warm blooded animals which are not of sanitary significance. High results should therefore be investigated by sanitary survey or other appropriate means to confirm the cause. Fecal coliform analysis, which means primarily coliform organisms from the feces of warm blooded animals, may be useful as a secondary indicator. Although the reliability of fecal coliform analysis is not yet adequate to use as a standard, it is desirable that correlation data be generated. The Region I Office of the U. S. Environmental Protection Agency has suggested criteria for fecal coliform data evaluation. Such criteria should be considered only as a guideline and can be found in Appendix A.

lished fact, as has the relative urgency attached to such actions. The extent of fact gathering measures by both the applicant and the regulatory agency under constraints of defense time schedules have been extensive and comprehensive, particularly in the areas where basic research had not been done.

(2) The Availability of Alternate Sites and Methods of Disposal.

The analysis prepared by the Navy in its supplement in response to the Court's order arrays various possible disposal sites and makes a comparison of their relative attributes. It is the Corps of Engineers opinion that this analysis is competent and displays facts accurately, thus meeting the requirements for site comparison, particularly from the standpoint of environmental factors. See Section 6, "Alternatives to the Proposed Action."

(3) Such Water Quality Standards as are Appropriate and Applicable by Law.

See §230.4-2 above

(b) CONSIDERATIONS RELATING TO DEGRADATION OF WATER USES AT PROPOSED DISPOSAL SITES.

(1) Municipal Water Supply Intakes.

Not applicable.

(2) Shellfish.

(i) See paragraph/s 6.55, 6.116

(ii) do. 6.116, 5.48

(iii) See paragraph/s 5.50, 3.61, 3.64

(iv) do. 5.10

(3) Fisheries.

(i) See paragraph/s 5.07, 5.08, 5.61, 5.62, 5.67-5.68

(ii) do. 5.10

(iii) Not applicable

(4) Wildlife.

(i) See paragraph/s 6.55

(ii) do. 5.02-5.05, 5.10

(iii) do. 5.49, 5.62

(5) Recreation Activities.

(i) See paragraph/s 5.01-5.10, 5.49-5.62, 6.58-6.70

(ii) do. 5.51

(iii) do. 5.59-5.60

(iv) do. 5.05, 5.55

(6) Threatened and Endangered Species.

See paragraph 5.63

(7) Benthic Life.

See paragraph 6.68

(8) Wetlands.

Not applicable.

(9) Submerged Vegetation.

Non-existent at proposed disposal site.

(10) Size of Disposal Site.

See paragraph 3.57 (New London).

11.06 DESIGNATION OF THE DISPOSAL SITE. The references in this impact statement contain numerous reports of investigation into dredged material disposal phenomena. In an area of science which only a few years ago did not attach a great deal of research, there has been an expanding interest particularly by concerned federal and state agencies and in the universities whose research programs have been supported to a large degree by state and federal grants. It is conceded that there remains a great deal of scientific research to be done in the future over a long span of time. The Corps relies on this continuing research as part of the quest for scientific knowledge and is prepared to change its outlook and regulations when such change is dictated by scientific inquiry. The consistent return from such studies thus far does not justify creation of a new outlook from the standpoint of regulation, but does mandate a continued investigation and surveillance of disposal activities. Therefore, based upon the analysis of all factors pertinent to this permit action, viz. the Navy's Supplement and Guidelines developed by the Administrator of the Environmental Protection Agency, the Corps of Engineers has preliminarily determined, subject to full compliance with its regulations, to designate the New London Dumping Ground for further disposal of dredged material from the New London project. This proposal will be subject to a determination by the Regional Administrator as to adverse effects, if any, created by the proposed disposal, pursuant to rules and regulations under Title 40 CFR part 230, article 230.1 (40 Fed. Reg. 41292, September 5, 1975). The Corps also will request the Regional Administrator to designate

a location called "East Hole" in the waters of Block Island Sound, for possible use as a disposal site under provisions of the <u>Marine Protection, Research and Sanctuaries Act</u> (33 USC 1413). The rationale for this site designation is to satisfy a possible requirement for an alternate site to be available in the event that the criteria are violated at the primary site.

11.07 CONDITIONS. The original conditions of the permit including the requirement for monitoring by the Navy will be continued in force. Modifications to the permit conditions will be made whenever deemed necessary and advisable to satisfy environmental protection objectives.

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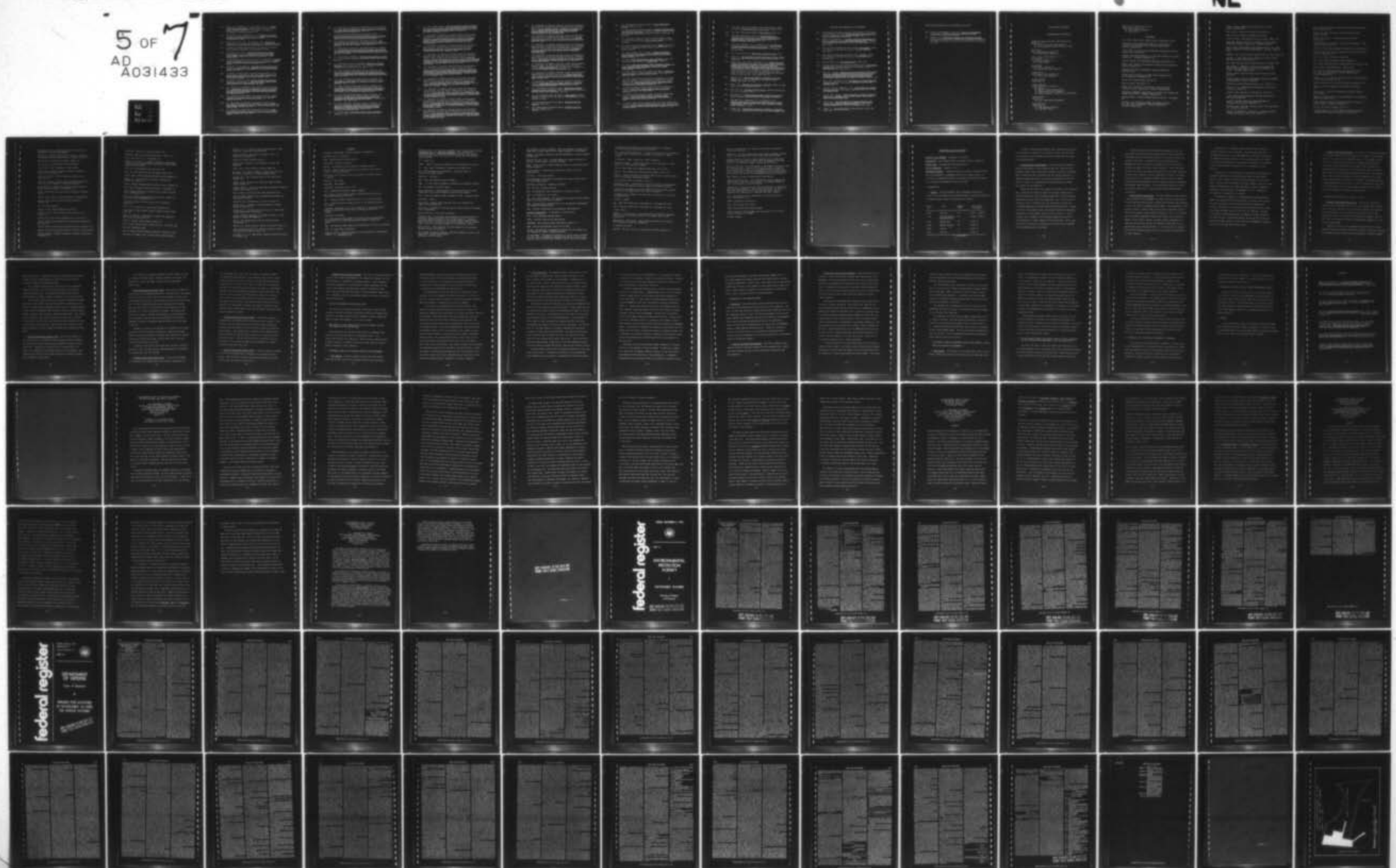

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GLOSSARY

Actinaria: Sea anemones; usually flowerlike in appearance.

Angelwing shells: Pelecypods.

ARDM: Medium Auxilary Floating Drydock.

Asteroidea: Sea stars; Starfish.

Benthic: Pertaining to aquatic bottom or sediment habitats.

Benthos: Aquatic organisms attached to or resting on the bottom or living in the bottom sediments.

Borrow Pits: Pits resulting from the excavation of mineral deposits ie. quarrys.

Brachyura: True crabs.

Bryozoans: Moss animals.

Centigrade: Temperature Units, (^{o}C).

CEIS: Candidate Environmental Impact Statement.

CEQ: Council on Environmental Quality established by the National Environmental Policy Act of 1968.

CH 1 : Channel Extension sampling station in the existing channel.

CH 2 : Channel Extension sampling station in the shoreside flats of the channel.

Chlorides: Considered a major anion especially in ocean waters where average concentrations are as high as 19 grams per 1000 ml of seawater.

Cirripedia: Barnacles.

COD : The chemical oxygen demand. This factor gives an approximation of the quantities of oxidizable materials present in waters and wastes.

COD_2 : The chemical oxygen demand after having been corrected for chlorides

COE: U.S. Army Corps of Engineers.

Coliform, Fecal: Coliforms originating in the intestines of warmblooded animals. ie: Escherichia coli.

Coliform, Total: All bacterial organisms of the coliform group including Escherichia coli and Aerobacter aerogenes. These organisms are classified as being aerobic and facultative anaerobic, gram negative, non-sporulating bacilli that produce acid and gas from the fermentation of lactose.

CT: Connecticut.

CTDEP: State of Connecticut Department of Environmental Protection.

CY: Cubic yards - Pertaining to quantities of dredge spoil.

DDT: Dichlorodiphenyltrichloroethane. Insecticide known to accumulate in animal tissues.

Depuration: Purifying

DEIS: Draft Environmental Impact Statement.

DMRP: U.S. Army Corps of Engineer's Dredge Material Research Program.

EPA: Environmental Protection Agency.

fecal streptococci: Another species of bacteria found to be normal inhabitants of the large intestine of man and other animals.

FEIS: Final Environmental Impact Statement of 1973. Reference (249).

Gastropods: Snails.

Heavy metals: Mercury (Hg), Lead (Pb), Zinc (Zn), Cadmium (Cd), Copper (Cu), Chromium (Cr).

Humic acid: A degradation-resistant material formed during the decomposition of vegatation.

Hydroid Skeletons: Polyp form of Hydrozoa.

Hydrometer Test: The standard test measures the settling time for an individual sediment particle to fall a distance of 14". The test requires a 1000 ml cylinder for the settling chamber using distilled water containing a flocculant as the settling medium. The test applies Stoke's law to the equivalent diameter of an individual particle.

Hydrozoa-Polyp: These organisms are often plant-like in appearance, sessile, and grow in colonies.

1st Increment of Channel Dredging: Describes dredging a portion of the Thames River channel from the mouth,
upstream to the I-95 bridge.

2nd Increment of Channel Dredging: Describes dredging a portion of the Thames River channel from the I-95 bridge, upstream to the NAVSUBASE.

ISASODS: Interagency Scientific Advisory Subcommittee on Ocean Dredging and Spoiling.

Kjeldahl Nitrogen, Total: Includes ammonia and organic nitrogen but does not include nitrate or nitrite nitrogen.

MACFC: Middle Atlantic Coastal Fisheries Center of the National Marine Fisheries Service.

Macro-organisms: Organisms that may be seen without the aid of magnification.

Microcosm: A miniature habitat.

Micro-organisms: Pertaining to organisms that cannot be seen without the aid of magnification.

Mercenaria, mercenaria: Quahog or pelecypod.

MGD: Millions of Gallons per Day.

mg/l: Milligrams per liter; equivalent to 1 part per million.

mg/m^3: Milligrams per cubic meter.

MPN: Most Probable Number. This abbreviation denotes the most probable number of bacteria per 100 ml of sample.

NMFS: National Marine Fisheries Service of the National Oceanographic and Atmospheric Administration.

NOAA: National Oceanographic and Atmospheric Administration.

Nuculana tenuisculcata: A pelecypod or bivalve mollusc.

NUSC: Naval Underwater Systems Center.

NYOSL: New York Ocean Science Laboratories.

NAVSUBASE: Naval Submarine Base, New London, Groton, CT.

NEPA: National Environmental Policy Act of 1969.

Nitrate: Biologically it represents the final form of nitrogen from the oxidation of organic nitrogen compounds.

Oil and Grease: The kinds and quantities of oil and grease contained in river waters or sediments, originate from various sources up and down the river but mostly from accidental spills. The oil and grease

is gradually incorporated into the bottom sediments by combining with silt particles and settling to the bottom.

PCB: Polychorinated Biphenyls - A chemical resulting from the manufacture of insecticides, plastics, etc; and known to accumulate in animal tissues.

Pelecypodia: Clams, oysters etc.; bivalve molluscs.

Percent Dry Weight: Percent dry weight x 10^4 is equivalent to 1 part million or 1 milligram per kilogram.

Phase I: Navy dredge spoil sampling period; May 21-23, 1975.

Phase II: Navy dredge spoil sampling period; August 15-18, 1975.

Phenols: Hydroxy derivatives of benzene usually found in waste products from oil refineries, and chemical plants.

Pier Projects: Refer to Figures 2-1 and 2-2.

Phosphorus; total: Includes both soluble and insoluble orthophosphates and condensed phosphates as well as organic and inorganic species.

Polychaeta: Sea worms; may be free swimming or tube building organisms having distinct segments each with a pair of parapodia.

Polychaeta tubes: Seaworm tubes which may be constructed of calcareous or membranous mats.

Porifera: Sponges.

ppb: Parts per billion and is equivalent to 1 microgram per liter.

ppm: Parts per million and is equivalent to 1 milligram per liter.

$1 \text{ ppm} = 10^3 \text{ ppb}$

Quaywall: A heavy gravity or platform structure fronting on navigable water used as a retaining structure at the inshore ends of slips between piers.

Rhynchocoela: Round worms. These ciliated organisms lack setae are soft, elongated, narrow and unsegmented.

S: Standard Deviation.

Salinity: The salt content of fresh water is usually reported 0.5

parts per thousand while the average concentration of seawater is 35 parts per thousand.

salmonella: The genus salmonella includes several pathogenic species to man. Primary diseases are typhoid fever and food poisoning.

Sediment Sampling Locations: Unless otherwise noted, samples were designated as being located North or South of proposed or existing piers, ie; 3N represents a sample location North of Pier 3.

Sorting Coefficient: This term applies to the degree of sorting of sediment particles and is a measure of the spread of the distribution. It is defined statistically as the standard deviation of grain size spread. Higher values indicate less homogeneous poorly sorted mixtures while lower values indicate more homogeneous better sorted mixtures.

SSMO: Summary of Synoptic Meteorological Observations.

Standard Grain Size Test: A seive analyses is used to separate the finest fraction from the coarse fraction. The standard hydrometer test is then applied to the fine fraction.

staphylococci: These bacteria are natural inhabitants of animals and are known human pathogens. They can be found on skin, in the nose, mouth and intestines as well as air, water and milk. They are responsible for causing boils, carbuncles and other diseases.

ug/l: Micrograms per liter, equivalent to 1 part per billion or .001 milligrams per liter.

UCONN: University of Connecticut.

Ulva: Marine algae; sea lettuce.

USCGA: United States Coast Guard Academy.

Volatile Solids: Percent weight loss on ignition of the volatile organics contained in a sample.

$\bar{X}$: Mean; average.

APPENDIX A

ENVIRONMENTAL IMPACT ASSESSMENT

SUBMITTING DOD COMPONENT: Department of the Navy

INSTALLATION: Naval Submarine Base, New London, Groton, Connecticut

PROJECT TITLE: Proposed Waterfront Construction

DATE OF SUBMISSION: December 1, 1975

ASSESSMENT AUTHORITY: "Prepared by Northern Division, Naval Facilities Engineering Command for Commander-in-Chief, U.S. Atlantic Fleet, in accordance with OPNAVINST 6240.3D in compliance with Section 102 (2)(c) of the National Environmental Policy Act of 1969"

1. INTRODUCTION

a. General: This environmental impact assessment evaluates the effects on the environment of six proposed projects involving construction in navigable waters. These six projects are as follows:

Project Nr.	Title	Program Year	Date of Last Assessment
P-112	Pier #32	'76	14 Mar 74 (REV.1)
P-145	Floating Drydock Mooring Facility	'76	22 Aug 73 (REV.1)
P-103	Weapons Pier	'79	18 Nov 75
P-164	Replace Pier #8	'79	18 Nov 75
P-084	Pier #1	U	18 Nov 75
P-142	Pier #33	U	18 Nov 75

U - unprogrammed

As noted, a separate environmental impact assessment was prepared at the inception of each of the six projects. Due to the similarity of the actions, these assessments have been combined into the single text presented herein.

b. Berthing Facility Requirements; The satisfaction of submarine berthing requirements at Naval Submarine Base, New London has been developed around several constraints including the width of the Thames River, current and tidal influences, and the location required for Submarine Lifting facilities; all with due consideration to both the types of vessels to be assigned and any existing facilities which are adequate for continued use.

Because of the width of the Thames River Channel at the Submarine Base, piers must be limited in length to one vessel length both to preclude obstruction of the navigable channel and to provide adequate maneuvering room for single screw submarines. Due to river currents, existing as well as proposed piers are constructed such that they are angled downstream for easier docking/undocking manuevers. Because of the rock terrain which exists, the logical location for drydocking facilities is in the general location of Piers 15 and 17. At this location, only a minimum of rock excavation might be required for the installation of larger submarine lifting facilities. Hence, this portion of the waterfront is dedicated to that use and the remainder of the waterfront used for berthing.

Neither present nor future berthing requirements for the Submarine Base are satisfied with existing piers which necessitates that replacement piers be constructed in addition to new pier construction. A special study (ref. 1) indicated that the pier spacing at the NAVSUBASE for single screw SSN type submarines should be such that a minimum slip width of 230 feet clear is available. Local experience in performing docking and undocking maneuvers with the larger submarines indicates that a minimum slip width approaching 325 feet is necessary. Several piers are at a minimum acceptable spacing, while the removal of selected other substandard piers will provide a minimally acceptable space between those remaining. It is intended that Military Construction Projects P-084, P-112, P-142 and P-164 remedy these berthing deficiencies.

c. Repair Facility Requirements: The Naval Submarine Support Facility, a tenant command at the NAVSUBASE, New London, has the assigned mission of performing authorized shipwork including interim repair and drydocking on nearly all types of submarines except SSBN's. The requirements of this mission continue to expand rapidly as more nuclear submarines join the fleet and as present nuclear submarines increase in age. Nuclear submarines are normally scheduled for major yard overhaul every thirty-six months; interim repairs, however, involving limited availability and requiring fast efficient service are necessary to keep SSN's at sea between these major overhaul periods. It is in this specific capacity that the Naval Submarine Support Facility can contribute significantly to fleet readiness.

Additionally, the submarine safety program requires a hull surveillance inspection every six months. This additional task can be accomplished efficiently at the NAVSUBASE with a minimum of interference in submarine operating schedules. There is great potential for service to the fleet at New London, but the vigorous continuation of the modernization program concerns the provision of a new submarine lifting facility.

Currently, Pier 17 is utilized as a repair pier and satisfies the berthing requirements for the two Auxiliary Repair Drydocks (ARD's) which are fully utilized to meet the current submarine lifting requirements. However, both of the ARD's are neither capable of lifting current long-hull submarines nor the longer and heavier classes of submarines scheduled to be homeported at the NAVSUBASE (ref. 3). Therefore, a new submarine lift capability is required.

To provide this capability, a medium Auxiliary Floating Drydock (ARDM), an industrial type floating drydock of one piece steel construction, will be moored at Pier 15 and will utilize an upgraded pier facility. The drydock is an open-end facility, which allows for a ship to be docked alongside the pier with either side adjacent. Although it is capable of being towed at sea, the ARDM will be shore dependent for utility service. The mooring facility and the utility services required by the ARDM, scheduled for delivery at the NAVSUBASE in November, 1977, will be provided under Project P-145.

d. Weapons Handling Requirements: The mission of the Weapons Department at the Naval Submarine Base, New London is the stowage, issue, overhaul, and test of assigned types of submarine weapons. The stowage function within this mission was accomplished in a magazine area adjacent to a developed area of the base until 1973 when it was relocated to an isolated and less central area in the northeastern corner of the base. This location for the ammunition stowage function was not only practical from a land utilization standpoint, but also conformed with the long-range functional land-use plan which consolidates all weapons facilities to the northern portion of the base. A step in realizing this objective is the construction of a pier for transfer of weapons at the northern end of the waterfront as proposed in Project P-103.

2. DESCRIPTION OF PROJECTS (see figures A-1, A-2)

a. Military Construction Project P-112: This project consists of constructing a new berthing pier, Pier 32, with concrete deck, concrete utility trenches, and steel piles with concrete jackets. The proposed pier is designed for a total of 840 feet (2 sides) of berthing and includes 15, 120 sq. ft. of area with complete pier services. The new pier, Pier 32, provides two berths to accomodate SSN submarines, including the new 688 class.

Supporting utilities to be provided for the new Pier 32 include electrical power (including a substation), lighting, fire alarm, television and telephone systems, portable water and wastewater collection systems,

and low pressure air. Additional utilities provided under this project include electrical and mechanical utilities at Pier 4 to allow for its use as a small craft berthing facility.

Also included in this project is the removal of two inadequate timber piers (Piers 3 and 14) to provide sufficient slip width for berths at adjacent piers. This removal work makes three existing berths adequate for SSN's at Piers 2-N (North), 13-N, and 15-S (South).

The removals of Piers 3 and 14 will include all decking, stringers, pile caps, wales, chocks, bolts and other material comprising the pier decks; all timber piles or remaining broken pieces to a minimum elevation of -40.0 feet; all mechanical and electrical utilities including piping, hangers, supports, valve stations, conduit and cable boxes. The construction of quay walls, both north and south of the new Pier 32, between existing Piers 13 and 15 and at the head end of the removed Piers 3 and 14 are included in this project. The quay walls will consist of steel sheet piling with a 12 foot reinforced concrete apron supported on steel piles.

b. Military Construction Project P-145: Project P-145 provides for the construction of a reinforced concrete mooring platform, including cast-in-place and precast concrete deck, supported on concrete filled steel piles. Contiguous to the North side of existing Pier 15, a twelve foot extension of an existing quay wall will be provided. The extension will consist of steel sheet piling and a reinforced concrete apron supported on steel piles.

Also included is a general upgrading of utility support on Pier 15 including electrical power, lighting, telephone, fire alarm, low pressure air, steam, salt water, potable water and wastewater utility lines.

c. Military Construction Project P-103: This project includes the construction of a new Weapons Handling Pier, and Quay Wall. The proposed pier will consist of concrete deck, utility trenches, on steel piles with complete pier services. The quay wall will consist of sheet piling with a 12 foot reinforced concrete apron supported on steel piles. This pier will be 440' x 60' and will provide berthing for (2) SSN submarines for loading and unloading of weapons. The weapons pier project will require a separate EIA regarding its siting (Exhibit 6) and the potential need for either land acquisition or restrictive easements to maintain an adequate explosive safety zone in the area of the pier.

Supporting utilities to be provided the new Weapons Pier include electrical service (including a substation), lighting, fire alarm fresh and salt water distribution systems, fuel and diesel oil system, telephone and television systems, sanitary waste water collection system and low pressure air system.

In addition, the project will require the relocation of marina facilities, golf club house and the vacating demolition or relocation of buildings 178, 353, 355, and 394.

d. Military Construction Project P-164: Project P-164 provides for the removal of a wooden Piers 8 and 9 and the construction of a

new replacement Pier 8 which will be capable of berthing (2) SSN's including 688 class submarines. The replacement Pier 8 will be sited midway between Piers 6 and 10 in order to provide maximum slip widths between Piers 6, 8 (new), and 10. Hence, in addition to providing two new 688 class submarine berths, the project also makes one substandard SSN berth at Pier 10S adequate by providing a proper slip width. The new pier will be 500 feet by 40 feet and will consist of a concrete deck, concrete utility trenches, steel piles with concrete jackets and complete pier services. Pier services include electrical service, lighting, fuel and diesel oil system, fire alarm, telephone and television systems, portable water service and wastewater collection systems, and low pressure air system.

e. Military Construction Project P-084: This project consists of constructing a new berthing Pier 1 with concrete deck, concrete utility trenches, and steel piles with concrete jackets, fender system and fittings, fuel off-loading facilities and hotel service for submarines and destroyers. The proposed pier is designed for two SSN 688 class submarine berths and includes 20,000 square feet of area with complete fuel pier services. The pier will be 500 feet long and 40 feet wide. This project also includes the demolition of existing Pier 1 which is 400 feet long and 48 feet wide.

f. Military Construction Project P-142: A new pier similar in design to new Pier 32 described above is proposed for construction by this project. The new Pier 33 would be constructed approximately 325 feet up river from and parallel to new Pier 32.

g. Dredging and Drege Spoil Disposal: The scopes of the above mentioned projects also include requirements for the removal and disposal of a combined quantity of 1,283,000 CY of dredged material. It was recognized during the preparation of the Environmental Impact Assessment for each project that dredging and dredge spoil disposal constituted a major action which should be made the subject of an Environmental Impact Statement. Therefore, only the environmental aspects of vertical construction are described below.

3. EXISTING ENVIRONMENT OF THE PROPOSED SITES

The project site locations have been traditionally used for berthing and are typical of the port facilities existing in the Thames River. Therefore, the subject projects are not expected to have a significant impact on either the aesthetics or the local ecology.

4. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

Areas affected by the proposed action consist of submerged lands which will be constructed upon or on unsubmerged lands on which construction activity will take place. There will be no adverse effects on plans, policies, or controls of the use of these lands as concerns Federal, Regional or State interests.

5. THE PROBABLE IMPACT OF THE PROPOSED ACTIONS ON THE ENVIRONMENT

a. Pier Removal: Pollution impacts resulting from pier removal operations in most cases will be contained based on past experiences,

NAVSUBASE personnel have indicated that the debris associated pier removal and construction will be adequately contained and disposed of by the contractor in accordance with established guidelines. A temporary but localized impact due to noise cannot be avoided and is expected to last throughout the contract period.

The dismantling of utilities from piers is expected to cause an impact due to the unraveling of asbestos insulation. In this regard the contractor will be required to comply with the EPA's "National Emission Standards for Hazardous Air Pollution" (NESHAP).

As the piers are disassembled and the pilings removed, small amounts of creosote may be released into the water as a type of oil pollution. However, the concentrations of creosote should have relatively little impact on the biota after having been diluted by river water. Removal of piers will also serve to destroy existing habitats and refuge areas serving forage fish and invertebrates which in turn feed on organisms attached to the piling substructures. There are several environmental benefits that can be ascribed to the removal of piers. The most obvious benefit is the reduction in the number of available berthing spaces. The corresponding decrease in pier usage will not only reduce sources of pollution but will also serve to decongest those areas of the port facility. The removal of wooden piers eliminates the undesirable impacts by the leaching of creosoted pilings. Finally, the removal of obstructions (pilings) from the river increases local current and tidal flows, reduces sedimentation and deposition of heavy metals and increases habitat availability to benthic organisms.

b. Pier Construction: The impacts related to construction of piers and quay walls at existing port facilities have been shown in the past to impose minimal impact on the environment. Similarly, it is not expected that vertical construction including the construction of quay walls will cause any major adverse environmental impacts. Except for a temporary impact due to construction noise and the localized disturbance of river sediments caused by the installation of steel H-piles, the impacts associated with construction should be of little significance and in some cases may serve to improve the environment.

The utility lines to be installed on new piers and the ARDM Mooring facility will use insulation other than asbestos. Wooden materials will not be used in the basic construction eliminating the impact of creosote leachings on the river. The construction of new piers will create additional berthing spaces for the SSN 688 submarines. The unavailability of the piers to other vessles and the improved facility will reduce substantially the chances for pollution related accidents. The substructures will recreate habitats for attached organisms and reestablish a refuge for forage fish and invertebrates. The proposed construction sites for Pier 32 and the Weapons Pier are in an area having better access to river currents and flushing tidal action. Once the polluted spoils have been dredged, redeposition of polluted sediments at these facilities should be minimal and provide a more suitable benthic habitat.

Several secondary impacts may be expected following the construction phase of the project. Although the introduction of the New SSN 688 class submarines are not expected to substantially increase the numbers

of personnel stationed at the NAVSUBASE (ref. 5) an increase of service utilities will be required to support the proposed facilities. Increases in electrical service and water demand are expected but will not be of major significance to local public utilities.

Shipboard sewage from berthing areas is presently being discharged directly to the Thames River. A NAVFAC NAVSEA report (ref. 7) presents projected sewage as well as other ship-to-shore waste generation by fiscal year (Table 1). The volumes of sewage generated by Navy ships at the NAVSUBASE are quite small and should be evaluated accordingly (Table 2). Two Military Construction Projects are underway which will abate shipboard sewage discharges to the river and increase the degree of sewage treatment from the NAVSUBASE. Project P-157 is providing ship-to-shore sewage connection during Fiscal Year 1976. Project P-093 is currently underway to provide a connection to the Town of Groton's waste treatment facility thus providing secondary treatment for NAVSUBASE sewage. This project is scheduled for completion during Fiscal Year 1977. Completion of the subject construction projects, previously defined, will be subsequent to this date, therefore, treatment of any wastewater generated at the drydocking and new berthing sites will be provided by the Town of Groton.

Operations at the floating drydock (ARDM), scheduled to be moored at Pier 15, will generate a variety of wastes. In addition to sewage, other wastes such as garbage, industrial wastes, oil and solid wastes are generated by the operations of floating drydocks. A Candidate Environmental Impact Statement (CEIS) on the Abrasive Blasting of Ship's

Hulls has been preprared by the Naval Ships Systems Command (ref. 2). This CEIS evaluates the impacts associated with sand blasting, painting and general maintenance of ship's hulls. These wastes must be periodically removed from the floor of the drydock to shore facilities for proper disposal. Proper cleanup is essential in the operation of a floating drydock in order to prevent pollution of adjoining waters.

6. ALTERNATIVES TO THE PROPOSED ACTIONS.

a. Do Nothing: The environmental impacts associated with waterfront construction are avoidable provided the action is not implemented. However, as previously described, existant berthing and drydocking facilities are inadequate and will not meet the future requirements of the new and larger SSN 688 class submarines scheduled to be ported at the NAVSUBASE. These required berthing and maintenance projects are necessary to support the new class of submarines and will insure that the NAVSUBASE remains a viable National Defense facility. Therefore, as stated in Section 5 of the FEIS (ref. 4) an alternative to Do-Nothing would limit the tactical development of the craft and would have an incalculable effect on the National Defense.

b. Construct Berthing Piers Elsewhere: The lack of adequate space prevents selecting alternate locations for the proposed piers. Proposed locations represent the most logical choices both economically and environmentally.

c. <u>Locate Drydocking Facility Elsewhere:</u> Drydocking facilities are required to fulfill the mission, assigned tasks and functions of the NAVSUBASE. All existing docking facilities are fully utilized and do not meet the requirements for docking the larger hulled, deeper draft SSN's. If adequate facilities are not provided, deployed submarines will be forced to utilize distant facilities which will increase costs, limit port time for crews, reduce operating capability and limit combat readiness.

Alternatives to drydocking SSN's include the use of and/or modification of existing facilities. Past studies have shown that the existing Marine Railway could be reconstructed to accommodate only the smallest and lightest of the SSN's, but it could not be reconstructed to accommodate assigned submarines which displace more than twice the design capacity of the original facility. While the Marine Railway could be reconstructed to accommodate a few assigned submarines, a new facility would still be required for the larger classes including the 688 class. The availability and use of an ARDM provides both the capacity to lift all assigned submarines plus the added flexibility to relocate the dock anywhere if the need should arise. Hence, the use of the Marine Railway is not a viable alternative.

A second alternative is to use private facilities for the maintenance of Naval vessels. The Electric Boat Division, General Dynamics Corporation, presently owns and operates two graving docks which have the capability to drydock and maintain the largest SSBN's. The graving

docks are used by Electric Boat for new construction and overhaul and are unavailable for the normal maintenance periods required to maintain operational readiness.

The third and most viable alternative in terms of fleet readiness, is the use of the floating auxiliary Repairs Drydocks (ARD's). The existing ARD's cannot accomodate the larger, heavier, deeper draft SSN 688 class submarines. In addition, each year the ARD's requires a considerable maintenance period which limits their availability and usefulness to the fleet.

The proposed use of the ARDM will fulfill the mission of the SUBASE and its tenant activities in providing faciltities to support the new SSN 688 class submarines.

To accommodate the operation of the ARDM a dredge depth of -59 ft. (MLW) is required. The underlying rock formations in the area limits the site location for the ARDM to Piers 15 and 17 (refs. 3, 6). Subaqueous borings have shown these areas to be free of bedrock to the required dredge depths. This in turn reduces the probability that blasting will occur and subsequently any adverse environmental impact resulting from such an action.

7. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROJECTS BE IMPLEMENTED.

a. Pier Removal: The removal of the existing timber piers, as previously related, may result in the adverse effect of land space utili-

zation, if salvaging of the timber and piping material is not feasible. If landfilling is required, the Town of Groton landfill is a very possible recipient of this material. It should be noted that the Navy currently has programmed a Military Construction Project to provide funding in the amount of $300,000 to pay its proportionate share for a shredder, which will allow for more economical land utilization at the Groton landfill. Although this shredder may not be capable of reducing the timber and piping materials resulting from this project, the Navy is aware of the need to reduce land consumption by solid waste disposal and is attempting, as evidenced by this funding, to assist in environmentally sound disposal of its waste in the New London-Groton area.

Other possible unavoidable adverse effects may result from the eventual operation of the SSN's to be drydocked and berthed at the proposed facilities. However, the inclusion of the wastewater collection systems, to be provided for both Piers 32 and 15, and proper disposal of other liquid and solid wastes generated as is required under Navy policy, should minimize these impacts.

8. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY.

The short term effect of the pier removals and construction will be primarily negative due to the added noise, water and possible aesthetic pollution during the course of the construction. Short term water pollution effects should result from some limited waterborne debris and

pollutants (including creosote) released during the removal of the piers and possible blasting. It is anticipated that the majority of the debris will be removed and the pollutants released will be sufficiently diluted by the river action. Additionally, if blasting is required, some shortterm losses may result in the aquatic biota, particularly in the immediate area of the removal operations.

The long term effects, 4 pier removals and construction, will be both positive and negative. The primary positive effect will be in the provision of berthing and drydocking facilities in conjunction with existing NAVSUBASE facilities in support of the National Defense. Also, by the removal of existing timber piers there will be a less positive, but still desirable effect in the removal of piers having a limited lifetime prior to their excessive deterioration.

The long term negative effects include possible additional land utilization resulting from the construction/removal solid waste debris disposal, the additional waste and oil discharges resulting from the operation of new piers and the reduced open river area due to the presence of additional waterfront facilities.

9. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible and irretrievable commitments of resources due to the implementation of the subject projects are primarily the labor, power and materials involved in the physical construction and removal operations. The most significant irreversible and irretrievable commitment of natural resources is the reduction in open river area

resulting from the pier construction. It has been determined that there will be no adverse impacts to cultural resources due to the construction phases of this project.

10. CONSIDERATIONS THAT OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS

As stated in Section 1.20, FEIS (ref. 4), "The determination to utilize the facilities at the NAVSUBASE for the development of the new 688 class nuclear powered submarines has been made by the Secretary of the Navy. The implementation of the subject projects will enable the Navy to provide adequate berthing and drydocking for the new submarines and meet its programmed commitments to the National Defense."

11. SUMMARY

It is concluded that except for associated dredging and dredge spoil disposal the projects listed in paragraph 1.a. above will have no significant impact on the environment thereby precluding the preparation of a more detailed Environmental Impact Statement.

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APPENDIX B

AN ENVIRONMENTAL SURVEY OF THE EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
MIDDLE ATLANTIC COASTAL FISHERIES CENTER
SANDY HOOK LABORATORY
Informal Report No. 75
August 1975

ABSTRACT OF 4th QUARTERLY REPORT
With Summary of First Year's Studies

Field and laboratory activities and achievements of subcontractors, the New York Ocean Science Laboratory (NYOSL) and University of Connecticut (UCONN), for the period 1 April - 30 June 1975 are discussed in the fourth quarterly report. Findings of the prime contractor, Middle Atlantic Coastal Fisheries Center (MACFC), are presented for 1 May to 30 July 1975. Several of the subcontractors' reports, as well as that of MACFC, contain summaries of earlier results and comparisons of recent data to those gathered during the predisposal period. Where this is not the case, we have added synopses of earlier reports - this material is indicated by brackets. Thus this abstract also serves as an interim report, highlighting the first year of the New London studies.

Surveying of dredging impacts on suspended materials in the Thames River has been completed by UCONN. The data confirm earlier indications that effects are limited to within 150 m of the dredge. A model of the river's flow characteristics has been selected and is in the testing

phase. [Three predredging surveys were conducted to determine baseline temperature, salinity, suspended solids and light transmission characteristics of the lower Thames River. These data were also used, in conjunction with historical information, to estimate predredging circulation of the lower river. The choice of the model of river flow characteristics is based on measurements taken at monthly or more frequent intervals before and during dredging. A number of high-resolution surveys made in the vicintiy of the working dredge have consistently shown that pertrubations are limited to within 150 m of dredging. Inside this radius, suspended materials increased from the typical river values of ca. 5 mg/l to as much as 150 mg/l, and particulate organic carbon from 1 to 4 mg/l. A surprising finding was that suspended materials in the plume resulting from dredging had proportionally fewer fine-size particles than did suspended matter from surrounding waters. It is not yet known why these fine materials are selectively removed from the water column.] Geofungi have been found to be more abundant in surface than in bottom waters, with numbers apparently related to salinity levels, but not to temperature or amounts of suspended sediment. The disposal area had low fungal counts.

Mercury in river water was lower in February and April 1975 than during earlier periods, perhaps due to the removal by dredging of contaminated sediments. [Predisposal sampling had shown mercury concentrations to undergo large fluctuations, from average river values of 50 nannograms/liter to a maximum of 410 ng/l. Periodic introduction of mercury from unknown sources was, therefore, indicated. The range of

fluctuations, as well as concentrations, have been smaller in more recent sampling.] Lowered Hg concentrations near the working dredge were again documented; this may be related to the finding that fine materials are selectively removed in the turbidity plume of the barge. Mercury was also lower in shellfish than found in predredging studies. Concentrations of several other metals in the three bivalves studied showed seasonal variation, with higher concentrations in samples collected in warmer periods. There were no other consistent trends in metal concentrations with time or geographic location in the river; effects of dredging on metal concentrations could not be demonstrated. Chlorophyll a values showed little or no depression in the dredging area. [Elutriate tests were run with predredging river sediments by shaking the sediments with seawater and measuring photosynthetic activity in light and dark bottles with and without the added filtered elutriate. The elutriates did not inhibit algal agal photosynthesis.]

SCUBA observations of the spoil pile showed the materials to be cohesive, and turbidity related to spoils low. Detailed sonic tracing experiments with dump site lobsters cannot be carried out until more specimens colonize the spoils. [Eight predisposal dives were made to observe, and obtain photographic evidence of: baseline bottom type, visibility and relative abundance of dominant species at the center and corners of the dumping ground. This information has been compared to that gathered from dives conducted subsequent to spoiling to determine the nature and extent of spoil impact. Numerous observations since the onset of dumping have confirmed that the spoils are generally

cohesive and apparently contribute little to turbidity. Since March 1975, considerable burrowing activity by lobsters and rock crabs, as well as colonization by infauna and presence of demersal finfish, have been documented at the original spoiling site.]

New York Ocean Science Laboratory personnel found that turbidity 100 m downstream from a barge dump increased greatly 12 minutes after the dump occurred (beam transmittan dropped to 0) but turbidity then returned to ambient within an hour of the dump. The turbidity cloud from a second dump, this time monitored 50 m upstream of the dump, required six minutes to travel that distance, with transmittance then returning to ambient after another 28 minutes. [Earlier studies had concentrated on using drogues to track and study the fates of turbidity plumes from individual dumping events. Dump-induced perturbations were found to be quite transient, with turbidity returning to ambient values in from ten minutes to two hours after a dump.] Current meter data again indicated eastward net drifts in surface waters and ENE near the bottom [Information from current meters deployed on prior surveys generally substantiated on easterly to northerly residual flow over the dumping ground. This disagrees with the results of several published studies which described net bottom drift for eastern Long Island Sound to be northwesterly. Seabed drifters used in the present survey have generally been recovered from the Connecticut coast west of New London, however, and a bottom drogue tracked over a complete tidal cycle on 5 August 1974 also indicated a net northwestern movement. Maximum current speeds reported to date were 100 cm/sec in surface

waters and 61 cm/sec at the bottom, both during a February 1975 survey.]

An unusual lens of warm, fresh water was reported north of the disposal buoy on 21 May. Waters throughout the disposal area in May had dissolved oxygen saturation percentages similar to predisposal values taken the previous July. Levels of suspended solids were lower than in prior samplings and were not related to distance from dumping. A dump monitored on an ebbing tide revealed impacts only at a station 1/2 mile E of the dump, where suspended solids increased significantly but returned to ambient concentrations within an hour. None of the other monitored parameters (dissolved oxygen, pH, Eh) were affected. [In conjunction with the physical oceanography section, earlier surveys studied effects of turbidity plumes from single barge releases on the water column. Dissolved oxygen was reduced, and suspended and volatile solids increased, after a dump, but in each experiment these parameters returned to ambient values almost immediately in surface waters and within two hours at the bottom. pH and Eh were generally unaffected by the spoil disposal.] Concentrations of heavy metals, Kjeldahl nitrogen and phosphorus in seston, sediments and benthic organisms are reported for samples analyzed during the quarter. Levels of these constituents in sediments were generally higher in the proximity of the disposal site. No significant trends were found in the seston and organism data. [Heavy metals, nitrogen and phosphorus in seston also showed no significant differences between predisposal values and those measured in September and December 1974. Metals in sediments were elevated at the stations nearest to spoiling activities. No patterns

were seen for metals in benthic organisms.]

[Demersal finfish populations on the dumping grounds were sampled in July and October 1974, and February and August 1975; the August data have not yet been reported. Overall finfish abundance was much lower in February 1975 within the same range as those collected at "control" stations located some distance from the designated spoiling area. Species commonly captured in summer 1974 were, in order of abundance, winter flounder, cunner, scup, windowpane flounder, tautog, little skate and northern searobin. In February 1975 populations were dominated by winter flounder, longhorn sculpin, and little skate. Gut content analysis has shown polychaete worms, amphipods, mysids and sand shrimp to be most important in the diets of demersal fish in this area.]

MACFC reported large decreases, apparently due to natural seasonality, in benthic macrofaunal densities throughout the study area between predisposal and April 1975 collections. Declines in numbers of species and species diversities were smaller except in the immediate spoiling area. The data suggest that the major detrimental effect of spoiling to date has been through actual burial of existing communities over a relatively small area within 1/2 mile of the disposal buoy. Some recolonization of the original spoils was evident from SCUBA and grab samples observations made this June and July. [All quarterly samplings have shown the study area to be very heterogeneous in terms of substrates and benthic faunal assemblages. A number of stations

have surficial sediments consisting of fine sand covered with a strata of silt. Tubedwelling amphipods are dominant in most of these areas. Several medium to coarse sand stations support sand-dollars and Astarte (a small bivalve) assemblages; finer bottoms are often characterized by the nut clam, Nucula. A kelp bed and a mussel bed containing numerous seastars are found at single stations. The river fauna contains several species, such as the snails Retusa and Cylichna, which have not been found on natural sediments in the disposal area, and are thus useful as tracers of spoil mateial.]

The fourth quarterly report uses both visual observation of grab samples and analysis of short sediment cores to determine the extent of the spoil pile. The former method appears reliable and indicates that, as of the June-July 1975 survey, spoil material was present at stations 1/4 mile from the original designated disposal point; spoils were not observed at any stations 1/2 mile or more from this point. Of three stations monitored, the diver-deployed sedimentation traps captured the least material at the station closest to the spoil pile; the traps also revealed a large gradient in nearbottom suspended materials. SCUBA was also used to make biological observations at nine stations for comparison with a similar survey conducted prior to the onset of dredging and dumping. Several changes in the fauna were noted including: reduced densities of amphipod tubes at three stations (though not at two other stations closer to the spoiling point); fewer numbers of anemones and blood stars at another station; and the reduction in numbers but growth of individual mussels in a

mussel bed at a fifth station. There was no evidence that any of these changes were related to spoil disposal, however.

[Predisposal water and sediment samples from 44 stations have been analyzed for fecal coliform and other bacteria. Highest fecal coliform counts were found in the river, with sediments at three of five stations containing densities in the range of 10,000 - 172,000/100 ml sediments. Disposal area counts were lower but were still considered "elevated", with 100 fecal coliforms/100 ml sediment at 30 of 39 stations. Densities did not differ significantly between stations within the spoil area (a circle of 1 mile radius from the dump site) and control stations outside this circle. Counts of total aerobic bacteria likewise showed river sediments to have higher concentrations than in the spoils or control areas, with no significant differences between the latter two. Coliform counts were higher at disposal area stations on an ebb than on a flood tide, indicating that the Thames River outflow can have an effect of water quality within the designated disposal area. Another comprehensive survey of sediment bacteria was conducted in July 1975. Completion of analyses on these post disposal samples will permit an assessment of dredging and spoiling impacts on the microbiology of the area.]

[In summary, no projects have demonstrated the dredging-dumping operation to have more than localized impacts. Water column perturbations have been limited to the spatial and temporal proximity of dredging and disposal operations. Effects on sediments and benthic macrofauna appear confined to those stations near the disposal point where spoils have accumulated during dumping operations.]

AN ENVIRONMENTAL SURVEY OF EFFECTS
OF DREDGING AND SPOIL DISPOSAL,
NEW LONDON, CONNECTICUT:
5TH QUARTERLY REPORT

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
MIDDLE ATLANTIC COASTAL FISHERIES CENTER
SANDY HOOK LABORATORY
Informal Report No. 84
November 1975

ABSTRACT

Surveys conducted by the University of Connecticut in the Thames River continue to indicate that short-term dredging impacts have been spatially and temporally limited. Assessment of long-term effects is still underway. This study includes testing of a numerical streamflow model which will aid in determining whether dredging has modified the river's hydraulic regime. Data in hand show that suspended loads in the Thames are more a function of intrusions of Fishers Island Sound water than of river flow levels. Mercury in river waters increased 4-5 fold between spring and summer 1975. This was attributed to natural seasonality rather than to dredging, since summer 1975 values were still well below the maximum predisposal (July 1974) levels measured. Analysis of other heavy metals in the water column has been slowed by equipment malfunctions, but the predisposal data now available show Thames River water to have had concentrations of zinc, copper, nickel and cadmium which were respectively 11, 2, 7 and 35 times as high as had been reported for the adjacent Sound. Cadmium increased

and mercury decreased in Crassostrea virginica, Pitar morrhuana and Mercenaria mercenaria between July 1974 and July 1975. P. morrhuana also experienced an increase in Zn, while Cu in C. Virginica and Ni in M. Mercenaria and P. morrhuana appeared to undergo seasonal fluctuations. No gross pathological conditions were detected in the shellfish.

The New York Ocean Science Laboratory continued its investigations of currents and water movements in the disposal area, and of the effects of dumping on water and sediment characteristics there. In one experiment conducted on an ebbing tide, surface and bottom drogues were tracked from the disposal buoy through the Race and well into Block Island Sound. On another ebb tide, the drogues moved east toward Fishers Island Sound, and then turned north and west as the tide began to flood. Turbidity changes measured along the paths of these drogues were minimal. Transmissometer readings taken after a barge release on July 9 again showed only transient increase in turbidity, with beam transmittance returning to ambient by 30 minutes after the dump. On July 17, transmissometer readings taken upstream and downstream of the spoil pile indicated that bottom waters gained approximately one mg/l of suspended materials in passing over the spoil pile on a maximum ebb tide. Transmissivity measurements were also taken on two other dates: once in conjunction with plankton tows on N-S and E-W transects from the dump bouy, and once to examine horizontal and vertical turbidity changes at NYOSL's standard sampling points through-

out the study area. In no case could a clear relation be seen between turbidity and proximity to the spoil pile. Current meter records again indicated that greatest velocities and durations at the disposal buoy were in a generally easterly direction.

Surveys of disposal area water quality were made on August 26 and September 17, 1975. Values for dissolved oxygen, pH, Eh, suspended and volatile solids were fairly uniform and unremarkable throughout the study area. Chemical oxygen demand and heavy metals of sediment generally had higher values near the center of the disposal area, but overall variations were thought to be random. No increases were seen when compared to January 1975 concentrations. It was concluded that no major changes attributable to dumping had yet been detected in sediments or water column.

Middle Atlantic Coastal Fisheries Center's grab sampling showed that as of October 1975, spoils extended somewhat further than 1/2 mile to the east and south of the disposal buoy, and between 1/4 and 1/2 mile in other directions. Calcium carbonate and organic contents of disposal area sediments fluctuated widely with space and time; based on these constituents alone, the spoils could not be distinguished from natural sediments at several stations. Macrofauna populations of June-July 1974 (predisposal) samples from ten stations were compared with the fauna of June-July 1975 collections. Changes significant at the 95% confidence level were found at only two stations. Station C3, a mile WNW of the disposal buoy, had a large increase in faunal density; this

was due largely to increased numbers of the amphipod, Ampelisca vadorum. Station C6, at the disposal buoy, had significant decreases in density, number of species and Shannon-Weaver species diversity. Changes at other stations showed no definite gradients of impacts relative to distance from the spoil pile. Control stations at two-mile radii from the disposal buoy had fluctuations as large as several stations in much closer proximity to the spoils. This evidence continues to support the earlier statement that major effects of spoiling to date have been limited to areas where fauna are actually buried by the spoils.

Recolonization at C6 was traced through October 1975 collections. By that time, faunal density, species richness and diversity had increased significantly over October 1974, January and April 1975 values, through values of samples and dive surveys agreed that the tube-dwelling amphipods (chiefly Ampelisca vadorum and Leptocheirus pinguis) which had characterized the predisposal fauna at C6, were beginning to reestablish themselves. The diving observations revealed that much of the spoil pile supported moderate densities of these amphipods and other tube-dwelling forms. A number of macroinvertebrates, finfish, burrows and tracks were also seen on the spoils. It was tentatively concluded that spoil materials were not inhospitable to biological activity, and that complete recolonization could eventually be expected. Sediment trap experiments showed no relation between distance from the spoils and amount of sedimenting material. Suspended sediment levels at the disposal buoy may be influenced more by river inputs than by resuspension of spoils.

AN ENVIRONMENTAL SURVEY OF EFFECTS
OF DREDGING AND SPOIL DISPOSAL,
NEW LONDON, CONNECTICUT:
6th QUARTERLY REPORT

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
MIDDLE ATLANTIC COASTAL FISHERIES CENTER
SANDY HOOK LABORATORY
Informal Report No. 107
April 1976

ABSTRACT

The Middle Atlantic Coastal Fisheries Center presented comparative data on benthic macrofauna populations of June 1974 (predisposal) versus June 1975, and October 1974 versus October 1975. At a station representing the original disposal point, significant decreases (according to 95% confidence limits) were found between Junes in number of individuals (N), number of species (S) and Shannon-Weaver species diversity (H'). Significant decreases in N were also found at stations located 1/2 n. mi. SE and NW of the disposal buoy, and at a control station two n. mi. NW of the buoy, while there was a significant increase in N at a station one n. mi. WNW of the disposal buoy. The species primarily responsible for these changes were listed. No species had systematic increases or decreases which might dictate their use as indicators of spoiling impacts. At the 14 stations for which between June comparisons are available, there was a substantial overall decrease in mean N per 0.1 m^2, from 458 $\pm$ 88 (S.E.M.) in June 1974 to 245 $\pm$ 39 a year later. These changes were thought attributable more to natural yearly fluctuations than to spoil effects, since large declines in

density were seen at "control" stations two n. mi. from the disposal buoy, while much smaller decreases ($383 \pm 81 \rightarrow 350 \pm 56$ individuals per $0.1\ m^2$) were found at five stations at one n. mi. distances from dumping. Changes in S betweeen Junes were, as a rule, slightly smaller than those for N, though patterns of change for the two parameters were identical. The decrease in patterns of change for the two parameters were identifcal. The decrease in S at the disposal buoy station was the only change found to be significant (95% confidence limits). Mean S for the 14 stations analyzed dropped from 41 ± 2 per $o.1\ m^2$ in June 1974 to 34 ± 3 in June 1975. Several of the largest decreases in S. between years were found at the three "control" stations, two n. mi. from the disposal buoy. At the five stations located one n. mi. from the buoy, mean S actually increased, from 41 ± 2 to 43 ± 4 species per $0.1\ m^2$. Changes in species diversity between years were smaller than for N or S. As with S, the only significant decrease in H' was found at the disposal buoy station.

Preliminary comparisons of October 1974 versus October 1975 samples again reveal apparently random, rather than spoil-related, changes outside of the spoil pile itself. There was a significant decrease in N at a control station 2 n mi. WNW of the disposal buoy, but a significant increase at another control nearby. Recolonization of the spoils was well underway by October 1975: N, S and H' were all significantly higher than values which had been found in the fresh spoils a year earlier. Amphipod crustaceans were most abundant of the colonizing forms, as they had been in the predisposal sediments. Reappearance of these species

may imply that 1) the dominant benthos can tolerate the spoil materials, 2) an eventual return to a near natural assemblage can be expected on the spoil pile, and 3) the tubes of these organisms may aid in stabilizing the spoils against erosion. It is also noteworthy that communities of the amphipods, which are known to be very important in the diets of the area's finfish, have apparently not been altered (as of a February 1976 reconnaissance cruise) at stations where large amounts of spoils are not present. On the February cruise, no spoils were detected in grabs taken at 1 n mi. from the disposal buoy in approximate directions W, WNW, NNE, E and ESE. Data on heavy metals concentrations in disposal area lobster reveal no significant uptake of metals between June 1974 and June 1975.

The University of Connecticut found only limited correlations between suspended loads in the Thames River and season or streamflow. Sediments suspended in surface waters were predominantly fine-grained while bottom waters had a bimodal distribution of sediment sizes. Geofungi concentrations were inversely related to salinity, and were low in samples collected at and 1/4 mile north of the disposal buoy. Hg concentrations in river water were lower in October-December than they had been the previous July, in agreement with previous data on seasonal changes in values of this metal. Sediment concentrations of Cd, Cu, Hg, Ni, Pb and Zn increased in an upriver direction, with highest values in areas of industrial and sewage treatment activity. Cu concentrations in the bivalves <u>Mercenaria</u>, <u>Pitar</u> and <u>Crassostrea</u> were the lowest yet measured in this study, while Ni values were

the highest found to date. No gross pathology has yet been detected in these bivalves.

The New York Ocean Science Laboratory, conducting current measurements over a lunar day, again found net bottom drift to be in a WNW direction on a flooding tide. On the next ebb, resultant bottom flow was toward the ESE, whereas prior surveys had documented NE to E net drifts. Maximum bottom currents were 49.4 (flood) and 59.4 (ebb) cm/sec. Transmissivity measurements made upstream and downstream of the spoil pile indicated that turbidity increased slightly as a water mass passed over the spoils. Suspended solids increased from October to December, but the proportion of volatile solids decreased. Eh, pH and dissolved oxygen of the water column shoed no spatial patterns or gradients relative to the disposal buoy. Total phosphorus and Kjeldahl nitrogen of sediments were highest in the Thames River; stations in the spoil pile had concentrations slightly higher than those in control areas.

AN ENVIRONMENTAL SURVEY OF EFFECTS
OF DREDGING AND SPOIL DISPOSAL,
NEW LONDON, CONNECTICUT:
7th QUARTERLY REPORT

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
MIDDLE ATLANTIC COASTAL FISHERIES CENTER
SANDY HOOK LABORATORY
Informal Report No. 116
August 1976

The Middle Atlantic Coastal Fisheries Center's analysis of benthic macrofauna populations continued to reveal no distinct impact of spoiling outside the immediate disposal area. Only small changes were found between winter 1974 and winter 1975 in species diversity, numbers of individuals and species at four stations located ½ - 1 n.mi from the disposal buoy. Populations of the overall dominant species, Ampelisca vadorum, showed no apparent effects of spoiling. Numbers of individuals and species on the spoil pile in February 1976 were greater than October 1975 values by 200 and 33%, respectively. A cruise was conducted on 25-26 May to provide organisms to the New York Ocean Science Laboratory (NYOSL) for analysis of tissue heavy metals concentrations.

The University of Connecticut, surveying effects of storms on suspended materials in the Thames River, demonstrated that the lower river is not much affected by routine storms. Impacts of dredging on overall concentrations of suspended materials were smaller still, since the area perturbed by the dredge was relatively circumscribed. Suspended material concentrations in the lower river continued to show little temporal change.

Concentrations of heavy metals in tissues of oysters, hard clams and another bivalve, Pitar morrhuana, from the Thames showed significant differences both among species and with time for a given species. The data indicate that the species concentrated metals differentially, but that the temporal changes were independent of dredging. No pathological abnormalities were detected in the hard clams sampled in March 1976. Mercury concentrations in river water in February were similar to October 1975 values. Concentrations were highest in bottom waters and in the lower river, suggesting a possible mercury source there. Metals and organic carbon of sediments increased in an upriver direction, and were strongly intercorrelated. Metal concentrations in the dredged portion of the river were lower than in predisposed samples.

NYOSL deployed an array of current meters at the disposal buoy during a period of stormy weather in February. As in past surveys, both surface and bottom currents had greatest durations in an easterly, or ebbing, direction - surface flow was actually almost halted by strong westerly winds on one flooding tide. Bottom currents during the storm were unusual in having greatest speeds (to 43.9 cm/sec) on flooding tides. Turbidity values were similar to those reported for December 1975. Of the surface drifters released at the disposal buoy, half of the returns reported to date have been to the NE of the buoy, 39% to the SE and 11% to the SW. Seventy per cent of bottom drifter returns have been from the NW, and 30% SW.

Suspended and volatile solids, Eh and pH of the water column in February were similar to values for December 1975 and earlier. Chemical oxygen demand and Kjeldahl nitrogen of sediments tended to increase with proximity to the disposal point.

APPENDIX C

federal register

FRIDAY, SEPTEMBER 5, 1975

PART II:

ENVIRONMENTAL PROTECTION AGENCY

■

NAVIGABLE WATERS

Discharge of Dredged or Fill Material

Title 40—Protection of the Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

[FRL 424-1]

PART 230—NAVIGABLE WATERS

Discharge of Dredged or Fill Material

The Administrator of the Environmental Protection Agency (EPA) on May 6, 1975, proposed guidelines, pursuant to section 404(b) of the Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500 (hereinafter, "the Act"), for the purpose of providing guidance to be applied in evaluating proposed discharge of dredged or fill material in navigable waters. The guidelines were developed in conjunction with the Army pursuant to section 404(b) of the Act.

Written comments were to be submitted to the Environmental Protection Agency by June 6, 1975. This date was extended to June 30 and consideration has been given to all comments received.

The guidelines are applicable to all activities involving the discharge of dredged or fill material in navigable waters, defined in the Act to mean "the waters of the United States, including the territorial seas." Such discharges are unlawful except in compliance with permits issued by the Secretary of the Army, acting through the Chief of Engineers, after notice and opportunity for public hearings (see 33 CFR 209.120, "Permits for Activities in Navigable Waters or Ocean Waters," published by the Corps of Engineers in the FEDERAL REGISTER on July 25, 1975). These guidelines are applicable to all Federal projects or activities, just as they are applicable to any other project or activity involving a discharge of dredged or fill materials.

Interim final guidelines are being published in order to provide immediate guidance in the implementation of the permit program under section 404 of the Act. While these guidelines become effective upon publication, there will be an additional comment period of 90 days in order that the public may comment further on any of its provisions. Thereafter, these comments will be reviewed and the guidelines modified if necessary.

The development of a permit program to regulate the discharge of dredged material and fill material in all waters of the United States has been the subject of intensive discussions between the Environmental Protection Agency and the Corps of Engineers, as well as other Federal and State agencies and the public. We have worked together in an effort to develop a program that is manageable, responsive to the concerns of protecting vital national water resources from destruction through irresponsible and irreversible decisions, and sensitive to the often conflicting needs and desires of people who utilize these resources. We have attempted to create a program that recognizes the need to interweave all concerns of the public in the decision-making process; that recognizes that present limitations on manpower preclude its immediate implementation throughout the country; and that we believe to be responsive to the overall objectives and needs of the Federal Water Pollution Control Act.

Section 230.1 summarizes the purpose and scope of the guidelines. Section 230.2 and Appendix A contain definitions to be used in the application of the guidelines in the program under section 404 of the Act.

The procedures for evaluating the discharge of dredged or fill material are outlined in § 230.3. This section is intended to emphasize that each provision of §§ 230.4 and 230.5 must be applied in reaching one of the following determinations: (1) Allowing the proposed discharge with appropriate discharge conditions to minimize unacceptable effects on the aquatic environment; (2) denying the proposed discharge when the discharge will have an unacceptable effect on the aquatic environment; or (3) requesting additional information where necessary to ensure a sound decision.

Section 230.4 presents general approaches for technical evaluation of discharges of dredged or fill material. Section 230.4-1 describes the types of ecological effects that may result from the discharge of dredged or fill material and technical approaches which are available to evaluate such effects where appropriate. Section 230.4-2 explains the considerations that will be given to water quality standards.

Section 230.5 presents objectives and considerations for evaluating proposed sites and for conditioning discharges so as to minimize harmful effects when the disposal site can be approved. All proposed discharges will be analyzed by application of each provision presented.

Section 230.6 provides guidance on the use of general permits for categories of discharge activities that will have only minimal effect on the aquatic environment. Section 330.7 encourages advanced study of aquatic areas to identify those areas of critical ecological concern and those areas that are less sensitive. It is expected that, where practicable, advanced identification of such areas will facilitate planning and improve evaluation of individual and general permits. State and local implementation of advanced planning through mechanisms such as Coastal Zone Management Programs will significantly contribute to the success of these studies.

The following analysis summarizes key comments received on various sections of the proposed guidelines and presents a rationale for the changes made:

(1) Several commenters suggested that the guidelines lack a strong committment to the spirit of the law by failing to place strict controls on the discretionary power given to the District Engineers. The nationwide application of a single set of guidelines to a variety of discharge activities in a myriad of different aquatic systems requires that the permitting agency retain the discretion to adapt the approaches and considerations in the guidelines to local conditions. However, many of the approaches and considerations have been rewritten to clarify that discharges will not be allowed if it is determined that the proposed discharge will result in unacceptable harm to the aquatic system.

(2) Several comments indicated confusion over the organization of the guidelines. The guidelines have been reorganized, renumbered and retitled to provide greater clarity and utility.

(3) Many commenters objected to the execution of raw material extraction from the section 404 permit system. The Corps of Engineers regulations and the guidelines now recognize that the discharge of material extracted and processed on shipboard is included in the section 404 program, while discharges from land-based processing are included in the National Pollutant Discharge Elimination System under section 402 of the Act.

(4) Most of the comments concerned technical analytical procedures, the adequacy of using the results as a description of constituents actually contained in sediments, whether constituents measured are actually available to aquatic organisms and humans, and the criteria for evaluating technical analyses. In addition to the comments volunteered by the interested public, we sought opinions of experts in each of the above areas of concern. All comments indicated that at this time none of the tests specified in the proposed guidelines can be used on a nationwide basis to examine all sediments thought to contain toxic substances. However, each of the technical evaluations specified in the proposed guidelines can be used meaningfully under some disposal conditions. Since there is no single technical evaluation available for nationwide use, additional physical analysis, bioassays, and biological evaluations have been added. Technical evaluations should be required only when a case-by-case review indicates that the results will provide information necessary to reach a final decision. When used carefully, the results of an appropriate technical evaluation in a given case will serve as one of many factors involved in the decision-making process. The Environmental Protection Agency, in conjunction with the Corps of Engineers will publish a procedures manual to provide details on technical evaluations. Interim technical guidance is available from the District Engineers.

(5) A number of commenters criticized the apparent lack of State participation in the permit program. It has never been the intention of this Agency or the Corps of Engineers to exclude the States from this program.

First, since each discharge of dredged or fill material into a navigable water is, in effect, the discharge of a pollutant into the water, a State water quality certification is required under section 401 of the Act before that discharge can be lawfully undertaken. Provision has therefore been made in the Corps of Engineers regulations (see 40 CFR 209.120(f)(3)) to indicate this legal requirement. Thus, any State may cause the denial of a section 404 permit if it chooses to deny a water quality certification. Similar situations also exist in those States with approved

Coastal Zone Management Programs: An individual in States with such programs must also certify that his activity will comply with the approved plan. On the other hand, where the State does not have such a certification program or delays the processing of its certification, the Corps of Engineers will still begin to process the section 404 permit. In absence of a timely response from the State, the section 404 permit will be processed to a conclusion.

Second, we are aware that some States have existing permit programs to regulate the same types of activities that will be regulated through section 404 of the Act by the Corps of Engineers. To the extent possible, it is our desire to support the State in its decision. Thus, where a State denies a permit, the Corps will not issue a section 404 permit. On the other hand, if a State issues a permit, the Corps would not deny its permit unless there are overriding environmental factors as reflected in these guidelines. We believe that conflicting decisions will be minimized if State permit programs include the policies, procedures, goals, requirements, and objectives embodied in the Corps permit program (see 40 CFR 209.120(f)(3)) and the national legislation which molded and supports it. This would include, for example, the concerns and requirements of the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Coastal Zone Management Act, and the FWPCA.

Finally provision has been made in the Corps regulations (see 40 CFR 209.120 (f)(3)) to allow the District Engineer to enter into an agreement with those States having ongoing permit programs which would enable joint processing of the Department of the Army and the State permit application to an independent conclusion by each entity. This would include joint public notices, joint public hearings, and the joint development, review, and analysis of information which leads to the final decision on a permit application. We strongly encourage States to work with District Engineers in this effort as this is a valuable mechanism for avoiding unnecessary duplication of effort.

Accordingly, having considered the comments received and other relevant information, the Administrator hereby adopts these guidelines as interim final, effective upon publication as guidance for evaluating all proposed discharges of dredged or fill material into the navigable waters, and also allowing 90 additional days for public comment after which time the guidelines may be modified if necessary.

All comments should be submitted to Eckardt C. Beck, Deputy Assistant Administrator for Water Planning and Standards, Office of Water and Hazardous Materials (WH-451), EPA, 401 M Street, S.W., Washington, D.C. 20460. All comments received on or before December 4, 1975 will be considered.

Dated: August 28, 1975.

RUSSELL E. TRAIN,
Administrator.

Interim final Part 230 is added to read as follows:

AUTHORITY: Sec. 404(b) Federal Water Pollution Control Act of 1972; Pub. L. 92-500.

§ 230.1 Purpose and scope.

(a) *Purpose.* The guidelines contained herein have been developed by the Administrator, Environmental Protection Agency in conjunction with the Secretary of the Army pursuant to section 404(b) of the Federal Water Pollution Control Act (33 USC 1344).

(1) These guidelines are required by section 404 of the Act to be applied in the issuance of permits for the discharge of dredged or fill material at specified disposal sites. In the event the District Engineer's application of the guidelines would preclude the discharge of dredged or fill material, the District Engineer in making the decision will also evaluate the economic impact on navigation and anchorage which will occur by failing to utilize the proposed disposal site.

(2) In addition, under section 404(c) of the Act, no discharge of dredged or fill material will occur at a proposed disposal site in a navigable water if the Administrator of EPA determines, after notice and opportunity for a public hearing and consultation with the Secretary of the Army, that such discharge will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife or recreational areas.

(b) *Applicability.* These guidelines are applicable to all activities involving the discharge of dredged or fill material in navigable waters. They will be applied by the Corps of Engineers in the review of proposed discharges of dredged or fill material into navigable waters which lie inside the baseline from which the territorial sea is measured or the discharge of fill material into the territorial sea pursuant to the procedures specified in 33 CFR 209.120 and 33 CFR 209.145.

(1) The discharge of dredge material into the territorial sea is governed by the Marine Protection, Research, and Sanctuaries Act of 1972, Pub. L. 92-532, and regulations and criteria issued pursuant thereto. (See 33 CFR 209.120, "Permits for Activities in Navigable Waters or Ocean Waters" and 33 CFR 209.145, "Federal Projects Involving the Disposal of Dredged Material in Navigable and Ocean Waters", and 40 CFR 227, "Ocean Dumping Final Regulations and Criteria".)

(2) These guidelines apply in a like manner to all discharges of dredged or fill material into navigable waters proposed to be undertaken by members of the general public and Federal Agencies including those Corps of Engineers operations that will result in such discharges.

§ 230.2 Definitions.

For purposes of this subpart 230, the following terms shall have the meanings indicated:

(a) The term "Act" means the Federal Water Pollution Control Act Amendments of 1972 (Pub. L. 92-500, 33 USC 1251 et seq.).

(b) The definitions set forth in 33 CFR 209.120(d) are incorporated herein by reference. These cover: navigable waters, dredged material, discharge of dredged material, fill material, and discharge of fill material. A copy of these definitions is appended hereto.

(c) The term "Regional Administrator" means the EPA Regional Administrator for the particular EPA Region in which dredged or fill material is proposed to be discharged.

(d) The term "District Engineer" means the District Engineer for the U.S. Army Corps of Engineers District in which dredged or fill material is proposed to be discharged or such other individual as may be designated by the Secretary of the Army to issue or deny permits under section 404 of the Act.

(e) The term "territorial sea" means the belt of the sea measured from the baseline as determined in accordance with the Convention on the Territorial Sea and the Contiguous Zone and extending seaward a distance of three miles.

(f) The term "disposal site" means the location within fixed geographic boundaries in which a discharge of dredged or fill material is proposed or has been undertaken, and includes the volume of water and the substrate over which such water volume lies, where applicable.

(g) The term "constituents" means the chemical substances, the solids, and the organisms associated with dredged or fill material.

§ 230.3 Evaluation procedures.

(a) All proposed discharges of dredged or fill material will be processed and evaluated in accordance with these guidelines and with applicable Corps of Engineers regulations (33 CFR 209.120 and 33 CFR 209.145).

(b) Upon issuance of the public notice required by 33 CFR 209.120(j) and 209.145(g) the District Engineer shall send a copy of the public notice to the Regional Administrator.

(c) The role of the Regional Administrator shall include consultation with the District Engineer on the interpretation of the guidelines, review and comment to the District Engineer on permit applications, and implementation of section 404(c) in appropriate cases.

(d) The District Engineer shall utilize these guidelines by making an eco-

logical evaluation following the guidance in § 230.4, including technical evaluation where appropriate, in conjunction with the evaluation considerations specified in § 230.5. This evaluation shall be utilized by the District Engineer in making one of the following determinations pursuant to section 404(b)(1) of the Act:

(1) Allowing the proposed discharge with appropriate discharge conditions to minimize unacceptable effects on the aquatic environment;

(2) Denying the proposed discharge when the discharge will have an unacceptable effect on the aquatic environment;

(3) Requesting additional information where necessary to ensure a sound decision.

(e) The District Engineer shall make use of the following approaches where practicable: Short form application procedures as may be subsequently developed by the Chief of Engineers for minor activities with minimal environmental effects; use of general permit procedures (see § 230.6); and advance identification of disposal areas (see § 230.7). Evaluation of the proposed discharge will also be made based on information contained in Environmental Impact Assessments, Environmental Impact Statements if required, Coastal Zone Management Programs, and River Basin Plans.

§ 230.4 General approaches for technical evaluation.

The effects of discharges of dredged or fill material on aquatic organisms and human uses of navigable waters may range from insignificant disruption to irreversible change at the disposal site. Section 230.4-1 describes the types of ecological effects that may result from the discharge of dredged or fill material and technical approaches to evaluate such effects. Ecological impact from dredged or fill material discharges can be divided into two main categories: (a) physical effects; and (b) chemical-biological interactive effects.

§ 230.4-1 Physical and chemical-biological interactive effects and approaches for evaluation.

No single test or approach can be applied in all cases to evaluate the effects of proposed discharges of dredged or fill material. Evaluation of the significance of physical effects often may be made without laboratory tests by examining the character of the dredged or fill material proposed for discharge and the discharge area with particular emphasis on the principles given in § 230.5. The chemical changes in water quality may best be simulated by use of an elutriate test. To the extent permitted by the state of the art, expected effects such as toxicity, stimulation, inhibition or bioaccumulation may best be estimated by appropriate bioassays. Suitability of the proposed disposal sites may be evaluated by the use, where appropriate, of sediment analysis or bioevaluation. In order to avoid unreasonable burdens on applicants in regard to the amounts and types of data to be provided, consideration will be given by the District Engineer to the economic cost of performing the evaluation, the utility of the data to be provided, and the nature and magnitude of any potential environmental effect. EPA in conjunction with the Corps of Engineers will publish a procedures manual that will cover summary and description of tests, definitions, sample collection and preservation, procedures, calculations, and references. Interim guidance to applicants concerning the applicability of specific approaches or procedures will be furnished by the District Engineer.

(a) *Physical Effects*. Physical effects on the aquatic environment include the potential destruction of wetlands, impairment of the water column, and the covering of benthic communities. Other physical effects include changes in bottom geometry and substrate composition that cause subsequent alterations in water circulation, salinity gradients and the exchange of constituents between sediments and overlying water with subsequent alterations of biological communities. (See § 230.5 of these guidelines.)

(1) From a national perspective, the degradation or destruction of aquatic resources by filling operations in wetlands is considered the most severe environmental impact covered by these guidelines. Evaluation procedures for determining the environmental effects of fill operations in wetlands are relatively straight forward. The guiding principle should be that destruction of highly productive wetlands may represent an irreversible loss of a valuable aquatic resource. (See 33 CFR 209.120(g)(3) and 230.5 of these guidelines.) Wetlands considered to perform important functions include but are not limited to the following:

(i) Wetlands that serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic or land species;

(ii) Wetlands set aside for study of the aquatic environment or as sanctuaries of refuges;

(iii) Wetlands contiguous to areas listed in paragraphs (a)(1) (i) and (ii) of this section, the destruction or alteration of which would affect detrimentally the natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns, or other environmental characteristics of the above areas;

(iv) Wetlands that are significant in shielding other areas from wave action, erosion or storm damage. Such wetlands often include barrier beaches, islands, reefs and bars;

(v) Wetlands that serve as valuable storage areas for storm and flood waters; and

(vi) Wetlands that are prime natural recharge areas. Prime recharge areas are locations where surface and ground water are directly interconnected.

(2) Effects on the water column are principally those associated with a reduction in light transmission, aesthetic values, and direct destructive effects on nektonic and planktonic populations. The significance of water column physical effects are not readily predicted by current technical approaches.

(3) The effect on benthos is essentially the covering of benthic communities with a subsequent change in community structure or function. It has been noted that the benthic community often will reestablish, although sometimes of a somewhat different ecological structure. Evaluation of the significance of the effect on the benthic community can be estimated prior to the discharge activity from a knowledge of the hydrodynamics of the disposal site, mode of discharge, volume of materials, particle size distribution and types of dredged or fill material, and from a knowledge of the benthic community.

(b) Chemical-biological interactive effects. Ecological perturbation caused by chemical-biological interactive effects resulting from discharges of dredged or fill material is very difficult to predict. Research performed to date has not clearly demonstrated the extent of chemical-biological interactive effects resulting from contaminants present in the dredged or fill material. The principal concerns of open water discharge of dredged or fill material that contain chemical contaminants are the potential effects on the water column or on benthic communities.

(1) *Evaluation of chemical-biological interactive effects*. Dredged or fill material may be excluded from the evaluation procedures specified in paragraphs (b)(2) and (3) of this section if any of the conditions specified in paragraphs (b)(1) (i), (ii) or (iii) of this section are determined to exist, unless the District Engineer, after evaluating and considering any comments received from the Regional Administrator, determines that these approaches and procedures are necessary. The Regional Administrator may require, on a case-by-case basis, testing approaches and procedures by stating what additional information is needed through further analyses and how the results of the analysis will be of value in evaluating potential environmental effects. Dredged or fill material may be excluded from this evaluation, if:

(i) Dredged or fill material is composed predominantly of sand, gravel, or any other naturally occurring sedimentary material with particle sizes larger than silt, characteristic of and generally found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels;

(ii) Dredged or fill material is for beach nourishment or restoration and is composed predominantly of sand, gravel or shell with particle sizes compatible with material on receiving shores; or

(iii) When:

(*a*) The material proposed for discharge is substantially the same as the substrate at the proposed disposal site; and

(*b*) The site from which the material proposed for discharge is to be taken is

sufficiently removed from sources of pollution to provide reasonable assurance that such material has not been contaminated by such pollution; and

(c) Adequate terms and conditions are imposed on the discharge of dredged or fill material to provide reasonable assurance that the material proposed for discharge will not be moved by currents or otherwise in a manner that is damaging to the environment outside the disposal site.

(2) *Water column effects.* Sediments normally contain constituents that exist in different chemical forms and are found in various concentrations in several locations within the sediment. The potentially bioavailable fraction of a sediment is dissolved in the sediment interstitial water or in a loosely bound form that is present in the sediment. In order to predict the effect on water quality due to release of contaminants from the sediment to the water column, an elutriate test may be used. The elutriate is the supernatant resulting from the vigorous 30-minute shaking of one part bottom sediment from the dredging site with four parts water (vol./vol.) collected from the dredging site followed by one-hour settling time and appropriate centrifugation and a 0.45u filtration. Major constituents to be analyzed in the elutriate are those deemed critical by the District Engineer, after evaluating and considering any comments received from the Regional Administrator, and considering known sources of discharges in the area and known characteristics of the extraction and disposal sites. Elutriate concentrations should be used in conjunction with the same constituents in disposal site water and other data which describe the volume and rate of the intended discharge, the type of discharge, the hydrodynamic regime at the disposal site, and other available information that aids in the evaluation of impact on water quality (see § 230.5 of these guidelines). The District Engineer may specify bioassays when he determines that such procedures will be of value. In reaching this determination, dilution and dispersion effects subsequent to the discharge at the disposal site will be considered.

(3) *Effects on benthos.* Evaluation of the significance of chemical-biological interactive effects on benthic organisms resulting from the discharge of dredged or fill material is extremely complex and demands procedures which are at the forefront of the current state of the art. Although research has shown that benthic species can ingest contaminated sediment particles, it has not been determined to what degree the contaminants are dissociated from the sediment and incorporated into benthic body tissues thereby gaining entry to the food web. The District Engineer may use an appropriate benthic bioassay when such procedures will be of value in assessing ecological effect and in establishing discharge conditions.

(c) *Procedure for comparison of sites.* (1) When an inventory of the total concentration of chemical constituents deemed critical by the District Engineer would be of value in comparing sediment at the dredging site with sediment at the disposal site, he may require a total sediment chemical analysis. Total sediment analysis is accomplished by concentrated strong acid digestion or solvent extraction for inorganic and organic constituents respectively. Markedly different concentrations of critical constituents between the excavation and disposal sites may aid in making an environmental assessment of the proposed disposal operation.

(2) When an analysis of biological community structure will be of value to assess the potential for adverse environmental impact at the proposed disposal site, a comparison of the biological characteristics between the excavation and disposal sites may be required by the District Engineer. Biological indicator species may be useful in evaluating the existing degree of stress at both sites. Sensitive species representing community components colonizing various substrate types within the sites should be identified as possible bioassay organisms if tests for toxicity are required. Community structure studies are expensive and time consuming, and therefore should be performed only when they will be of value in determining discharge conditions. This is particularly applicable to large quantities of dredged material known to contain adverse quantities of toxic materials. Community studies should include benthic organisms such as microbiota and harvestable shellfish and finfish. Abundance, diversity, and distribution should be documented and correlated with substrate type and other appropriate physical and chemical environmental characteristics.

§ 230.4–2 Water quality considerations.

After application of the approaches presented in § 230.4, the District Engineer will compare the concentrations of appropriate constituents to applicable narrative and numerical guidance contained in such water quality standards as are applicable by law. In the event that such discharge would cause a violation of such appropriate and legally applicable standards at the perimeter of the disposal site after consideration of the mixing zone (see § 230.5(e)) discharge shall be prohibited.

§ 230.5 Selection of disposal sites and conditioning of discharges of dredged or fill material.

(a) *General considerations and objectives.* In evaluating whether to permit a proposed discharge of dredged or fill material into navigable waters, consideration shall be given to the need for the proposed activity (see 33 CFR 209.120 and 33 CFR 209.145), the availability of alternate sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law. The following objectives shall be considered in making a determination on any proposed discharge:

(1) Avoid discharge activities that significantly disrupt the chemical, physical and biological integrity of the aquatic ecosystem, of which aquatic biota, the substrate, and the normal fluctuations of water level are integral components;

(2) Avoid discharge activities that significantly disrupt the food chain including alterations or decrease in diversity of plant and animal species;

(3) Avoid discharge activities that inhibit the movement of fauna especially their movement into and out of feeding, spawning, breeding and nursery areas;

(4) Avoid discharge activities that will destroy wetland areas having significant functions in maintenance of water quality;

(5) Recognize that discharge activities might destroy or isolate areas that serve the function of retaining natural high waters or flood waters;

(6) Minimize, where practicable, adverse turbidity levels resulting from the discharge of material;

(7) Minimize discharge activities that will degrade aesthetic, recreational, and economic values;

(8) Avoid degradation of water quality as determined through application of § 230.4, 230.5 (c) and (d).

(b) *Considerations relating to degradation of water uses at proposed disposal sites*—(1) *Municipal water supply intakes.* No disposal site may be designated in the proximity of a public water supply intake. The District Engineer and the Regional Administrator will determine the acceptable location of the disposal site in such cases.

(2) *Shellfish.* (i) Disposal sites for dredged or fill material shall not be designated in areas of concentrated shellfish production. In the case of widely dispersed shellfish populations where it is demonstrated by the applicant that the avoidance of shellfish population areas is impossible the disposal site may be located within such areas, but should be situated so as to cause the least impact on the shellfish population with particular reference to the burial of living forms and maintenance of a suitable substrate.

(ii) Disposal sites should be located to minimize or prevent the possible movement of pollutants by currents or wave action into productive shellfish beds.

(iii) Banks formed by dredged or fill material should be located and oriented to prevent undesirable changes in current patterns, salinity patterns and flushing rates which may affect shellfish.

(iv) The disposal operation should be scheduled to avoid interference with reproductive processes and avoid undue stress to juvenile forms of shellfish.

(3) *Fisheries.* (i) Significant disruptions of fish spawning and nursery areas should be avoided.

(ii) Dredging and disposal operations should be scheduled to avoid interference with fish spawning cycles and to minimize interference with migration patterns and routes.

(iii) Consideration shall be given to preservation of submersed and emergent vegetation.

(4) *Wildlife.* Disposal sites will be designated so as to minimize the impact

on habitat, the food chain, community structures of wildlife, and marine or aquatic sanctuaries.

(5) *Recreation activities.* In evaluating proposed discharges of dredged or fill material in or near recreational areas, the following factors should be considered:

(i) Reasonable methods should be employed to minimize any increase in amount and duration of turbidity which would reduce the numbers and diversity of fish or cause a significant aesthetically displeasing change in the color, taste, or odor of the water.

(ii) Release of nutrients from dredged or fill material should be minimized in or to prevent eutrophication, the degradation of aesthetic values, and impairment of recreation uses.

(iii) No material that will result in unacceptable levels of pathogenic organisms shall be discharged in areas used for recreation involving physical contact with the water.

(iv) No material shall be discharged which will release oil and grease in harmful quantities as defined in 40 CFR 110.

(6) *Threatened and endangered species.* No discharge will be allowed that will jeopardize the continued existence of threatened or endangered species or destroy or modify the habitat of those species determined critical in accordance with the Endangered Species Act.

(7) *Benthic life.* Disposal sites should be areas where benthic life which might be damaged by the discharge is minimal recognizing that enhancement may also occur. Use of existing disposal sites is generally desirable.

(8) *Wetlands.* (i) Discharge of dredged material in wetlands may be permitted only when it can be demonstrated that the site selected is the least environmentally damaging alternative; provided, however, that the wetlands disposal site may be permitted if the applicant is able to demonstrate that other alternatives are not practicable and that the wetlands disposal will not have an unacceptable adverse impact on the aquatic resources. Where the discharge is part of an approved Federal program which will protect or enhance the value of the wetlands to the ecosystem, the site may be permitted.

(ii) Discharge of fill material in wetlands shall not be permitted unless the applicant clearly demonstrates the following:

(*a*) the activity associated with the fill must have direct access or proximity to, or be located in, the water resources in order to fulfill its basic purpose, or that other site or construction alternatives are not practicable; and

(*b*) that the proposed fill and the activity associated with it will not cause a permanent unacceptable disruption to the beneficial water quality uses of the affected aquatic ecosystem, or that the discharge is part of an approved Federal program which will protect or enhance the value of the wetlands to the ecosystem.

(9) *Submersed Vegetation.* Disposal sites shall be located to minimize the impact on submersed grassflats (for example *Thalassia* and *Zostera* beds) and other areas containing submersed vegetation of significant biological productivity.

(10) *Size of disposal site.* The specified disposal site shall be confined to the smallest practicable area consistent with the type of dispersion determined to be appropriate by the application of these guidelines. Although the impact of the particular discharge may constitute a minor change, the cumulative effect of numerous such piecemeal changes often results in a major impairment of the water resource and interferes with the productivity and water quality processes of existing environmental systems. Thus, the particular disposal site will be evaluated with the recognition that it is part of a complete and interrelated ecosystem. The District Engineer may undertake reviews of particular areas in response to new applications, and in consultation with the appropriate Regional Director of the Fish and Wildlife Service, the Regional Director of the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration, the Regional Administrator of the Environmental Protection Agency, the State Conservationist of the Soil Conservation Service of the Department of Agriculture, and the head of the appropriate State agencies, including the State Director of an approved Coastal Zone Management Program, to assess the cumulative effect of activities in such areas.

(c) The following may also be considered in determining the site and disposal conditions to minimize the possibility of harmful effects:

(1) Appropriate scientific literature, such as the National Water Quality Criteria developed by the Administrator, pursuant to section 304(a)(1) of the Act;

(2) Alternatives to open water disposal such as upland or confined disposal;

(3) Disposal sites where physical environmental characteristics are most amenable to the type of dispersion desired;

(4) Disposal seaward of the baseline of the territorial sea;

(5) Covering contaminated dredged material with cleaner material;

(6) Conditions to minimize the effect of runoff from confined areas on the aquatic environment; and

(7) The Regional Administrator may specify appropriate monitoring conditions in proximity of disposal sites where necessary to control and minimize water quality degradation, pursuant to Section 308 of the Act.

(d) *Contaminated fill material restrictions.* The discharge of fill material originating from a land source shall not be allowed when the District Engineer determines that the material contains unacceptable quantities, concentrations or forms of the constituents deemed critical by the District Engineer or the Regional Administrator for the proposed disposal site, unless such material is effectively confined to prevent the discharge, leaching, or erosion of the material outside the confined area. Appropriate approaches in 230.4 may be used in making this determination.

(e) *Mixing zone determination.* The mixing zone shall be the smallest practicable mixing zone within each specified disposal site, consistent with the objectives of these guidelines, in which desired concentrations of constituents must be achieved.

The District Engineer and the Regional Administrator shall consider the following factors in determining the acceptability of a proposed mixing zone:

(1) Surface area, shape and volume of the discharge site;

(2) Current velocity, direction and consistency at the discharge site;

(3) Degree of turbulence;

(4) Stratification attributable to causes which include without limitation salinity, obstructions, and specific gravity;

(5) Any on-site studies or mathematical models which have been developed with respect to mixing patterns at the discharge site; and

(6) Such other factors prevailing at the discharge site that affect rates and patterns of mixing.

§ 230.6 General or categorical permits.

(a) The District Engineer upon compliance with the procedures of 33 CFR 209.120 may issue a general permit for a clearly described category of discharge activities if he determines that the category meets the following conditions:

(1) The activities included in the category are substantially similar in nature; and

(2) The activities included in the category have substantially similar impact on water quality and the aquatic system, and the adverse impact on water quality and the aquatic system is minimal for each discharge activity; and

(3) The cumulative impact of the total number of activities predicted to occur during the period authorized by the permit, is expected to have only minimal adverse effect on water quality and the aquatic system.

(b) The District Engineer, may condition general permits to require dischargers to submit the following information at least 45 days prior to commencement of the discharge of dredged or fill material:

(1) The name and address of the discharger.

(2) The location of the contemplated activity including the name and general description of the receiving waters, including wetlands, and the size of the area to be filled.

(3) A brief description of the proposed activity, its purpose and intended use, including a description of the type of structures, if any, to be erected on fills.

(4) A description of the type, composition, and quantity of materials to be discharged and means of conveyance.

(5) A copy of other Federal, State, and local government authorizations obtained including a State water-quality

certification under Section 401 of the Federal Water Pollution Control Act and, where applicable, a certification of compliance with an approved State Coastal Zone Management Program pursuant to Section 307(c)(3) of the Coastal Zone Management Act.

(c) If reporting is required the District Engineer shall record the individual disposal site as authorized and authorization will occur automatically 30 days after receipt of notification unless the applicant is otherwise notified by the District Engineer.

(d) A general permit may be revoked completely or partially by the District Engineer independently or on the advice of the Regional Administrator, if he determines that the discharges of dredged or fill material authorized by it or the cumulative effects thereof will have an adverse impact on water quality and the aquatic sytem. Following revocation, any discharges of dredged or fill material in areas formerly covered by the general permit shall be processed as individual permits under this regulation.

§ 230.7 Advanced identification of dredged material disposal areas.

(a) The District Engineer and the Regional Administrator, after consultation with the affected State or States, may at their discretion and consistent with the guidelines, identify areas which will be considered as:

(1) Possible future disposal sites; or

(2) Areas which will not be available for disposal site specification.

(b) The identification of any area as a possible future disposal site shall not be deemed to constitute a permit for the discharge of dredged or fill material within such areas, but may be used in evaluating individual or general permit applications.

(c) A record of areas so identified shall be maintained at the offices of the District Engineer and the Regional Administrator.

(d) To provide the basis for advanced identification of disposal areas and of areas not available for disposal, the Regional Administrator and the District Engineer should assess waterbodies to determine those areas which are of critical ecological concern, those which are of environmental concern, and nonsensitive areas. To facilitate this analysis, they should assemble water resource management data including such data as may be available from the other Federal and State agencies listed in § 230.5(b)(10) and information from approved Coastal Zone Management Programs and River Basin Plans.

§ 230.8 Revision.

The provisions of these guidelines will be periodically reviewed by the Administrator in conjunction with the Secretary of the Army pursuant to section 404(b)(1) of the Act. The guidelines may not be modified without approval of the Secretary of the Army and the Administrator. Any proposed revisions, or notice that a review has been completed and no revisions are proposed, will be published in the FEDERAL REGISTER within three years of the date of this initial promulgation or earlier as determined by research results and affirmed by the Administrator in conjunction with the Secretary of the Army.

APPENDIX A

DEFINITIONS FROM 33 CFR 209.120, "PERMITS FOR WORK IN NAVIGABLE WATERS OR OCEAN WATERS"

(1) "Navigable waters of the United States." The term, "navigable waters of the United States," is administratively defined to mean waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate commerce landward to their ordinary high water mark and up to the head of navigation as determined by the Chief of Engineers, and also waters that are subject to the ebb and flow of the tide shoreward to their mean high water mark (mean higher high water mark on the Pacific Coast). See 33 CFR 209.260 (ER 1165-2-302) for a more definitive explanation of this term.

(2) "Navigable waters". (i) The term, "navigable waters," as used herein for purposes of Section 404 of the Federal Water Pollution Control Act, is administratively defined to mean waters of the United States including the territorial seas with respect to the disposal of fill material and excluding the territorial sea with respect to the disposal of dredged material and shall include the following waters:

(a) Coastal waters that are navigable waters of the United States subject to the ebb and flow of the tide, shoreward to their mean high water mark (mean higher high water mark on the Pacific coast);

(b) All coastal wetlands, mudflats, swamps, and similar areas that are contiguous or adjacent to other navigable waters. "Coastal wetlands" includes marshes and shallows and means those areas periodically inundated by saline or brackish waters and that are normally characterized by the prevalence of salt or brackish water vegetation capable of growth and reproduction;

(c) Rivers, lakes, streams, and artificial water bodies that are navigable waters of the United States up to their headwaters and landward to their ordinary high water mark;

(d) All artificially created channels and canals used for recreational or other navigational purposes that are connected to other navigable waters, landward to their ordinary high water mark;

(e) All tributaries of navigable waters of the United States up to their headwaters and landward to their ordinary high water mark;

(f) Interstate waters landward to their ordinary high water mark and up to their headwaters;

(g) Intrastate lakes, rivers and streams landward to their ordinary high water mark and up to their headwaters that are utilized:

(1) By interstate travelers for water-related recreational purposes;

(2) For the removal of fish that are sold in interstate commerce;

(3) For industrial purposes by industries in interstate commerce; or

(4) In the production of agricultural commodities sold or transported in interstate commerce;

(h) Freshwater wetlands including marshes, shallows, swamps and, similar areas that are contiguous or adjacent to other navigable waters and that support freshwater vegetation. "Freshwater wetlands" means those areas that are periodically inundated and that are normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction; and

(i) those other waters which the District Engineer determines necessitate regulation for the protection of water quality as expressed in the guidelines (40 CFR 230). For example, in the case of intermittent rivers, streams, tributaries, and perched wetlands that are not contiguous or adjacent to navigable waters identified in paragraphs (a)-(h) a decision on jurisdiction shall be made by the District Engineer.

(ii) The followng additional terms are defined as follows:

(a) "Ordinary high water mark" with respect to inland fresh water means the line on the shore established by analysis of all daily high waters. It is established as that point on the shore that is inundated 25% of the time and is derived by a flow-duration curve for the particular water body that is based on available water stage data. It may also be estimated by erosion or easily recognized characteristics such as shelving, change in the character of the soil, destruction of terrestrial vegetation or its inability to grow, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area;

(b) "Mean high water mark" with respect to ocean and coastal waters means the line on the shore established by the average of all high tides (all higher high tides on the Pacific Coast). It is established by survey based on available tidal data (preferably averaged over a period of 18.6 years because of the variations in tide). In the absence of such data, less precise methods to determine the mean high water mark may be used, such as physical markings or comparison of the area in question with an area having similar physical characteristics for which tidal data are already available;

(c) "Lakes" means natural bodies of water greater than five acres in surface area and all bodies of standing water created by the impounding of navigable waters identified in paragraphs (a)-(h), above. Stock watering ponds and settling basins that are not created by such impoundments are not included;

(d) "Headwaters" means the point on the stream above which the flow is normally less han 5 cubic feet per second; provided, however, the volume of flow, point and nonpoint source discharge characteristics of the watershed, and other factors that may impact on the water quality of waters of the United States will be considered in determining this upstream limit; and

(e) "Primary tributaries" means the main stems of tributaries directly connecting to navigable waters of the United States up to their headwaters and does not include any additional tributaries extending off of the main stems of these tributaries.

(3) "Ocean waters". The term "ocean waters," as defined in the Marine Protection, Research, and Sanctuaries Act of 1972 (Pub. L. 92-532), 86 Stat. 1052), means those waters of the open seas lying seaward of the base line from which the territorial sea is measured as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639).

(4) "Dredged material". The term "dredged material" means material that is excavated or dredged from navigable waters. The term does not include material resulting from normal farming, silviculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting, for production of food, fiber, and forest products.

(5) "Discharge of dredged material". The term "discharge of dredged material" means any addition of dredged material, in excess of one cubic yard when used in a single or incidental operation, into navigable waters. The term includes, without limitation, the addition of dredged material to a specified disposal site located in navigable waters and the runoff or overflow from a contained land or water disposal area. Discharges of pollutants into navigable waters resulting from the onshore subsequent processing of dredged material that is extracted for any commercial use (other than fill) are not included within this term and are subject to section 402 of the Federal Water Pollution Control Act even though the extraction of such material may require a permit from the Corps of Engineers under section 10 of the River and Harbor Act of 1899.

(6) "Fill material." The term "fill material" means any pollutant used to create fill in the traditional sense of replacing an aquatic area with dry land or of changing the bottom elevation of a water body for any purpose. "Fill material" does not include the following:

(i) Material resulting from normal farming, silviculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting, for the production of food, fiber, and forest products;

(ii) Material placed for the purpose of maintenance, including emergency reconstruction of recently damaged parts of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, and bridge abutments or approaches, and transportation structures;

(iii) Additions to these categories of activities that are not "fill" will be considered periodically and these regulations amended accordingly.

(7) "Discharge of fill material." The term "discharge of fill material" means the addition of fill material into navigable waters for the purpose of creating fastlands, elevations of land beneath navigable waters, or for impoundments of water. The term generally includes, without limitation, the following activities in a navigable water: placement of fill that is necessary to the construction of any structure; the building of any structure or impoundment requiring rock, sand, dirt, or other pollutants for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands, property protection and/or reclamation devices such as riprap, groins, seawalls, breakwalls, and bulkheads and fills; beach nourishment; levees; sanitary landfills; fill for structures such as sewage treatment facilities, intake and outfall pipes associated with power plants, and subaqueous utility lines; and artificial reefs.

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PART IV

DEPARTMENT OF DEFENSE

Corps of Engineers

■

PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS

Title 33—Navigation and Navigable Waters

CHAPTER II—CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

PART 209—ADMINISTRATIVE PROCEDURE

Permits for Activities in Navigable Waters or Ocean Waters

On May 6, 1975, the Department of the Army, acting through the Corps of Engineers, published four alternative proposed regulations in response to the order of the United States District Court for the District of Columbia in *NRDC* v. *Callaway*, et al., ____ F. Supp. ____, 7 ERC 1784, (D.D.C., March 27, 1975). Each of the four alternative proposed regulations pertained to the regulation, by the Corps of Engineers, of those activities involving the discharge of dredged or fill material in navigable waters pursuant to section 404 of the Federal Water Pollution Control Act Amendments of 1972 (hereinafter referred to as the FWPCA). Each of these alternatives offered an administrative definition of the term "navigable waters" for public review and comment, as well as a definition of the terms "fill material" and "dredged material" and varying procedures to implement the regulatory permit program under Section 404 of the FWPCA.

Over 4,500 comments were received in response to this regulation. Those responding to the regulation included a large number of Governors; members of Congress; Federal, State, and local agencies; environmental organizations; commercial, industrial, and trade organizations; port authorities; agricultural organizations; and individual members of the public. A large number of these comments addressed the issue of whether there should or should not be a Federal permit program to regulate the discharge of dredged or fill material in navigable waters (defined in the FWPCA as "waters of the United States") rather than the particular provisions in the four alternative proposed regulations under review. Many comments appeared to be responses to the wide spread news coverage of the proposed regulation.

Those comments which did address substantive aspects of the regulation were helpful in meeting the dual purposes of the FWPCA: First, the development of a workable program; and, second, the needs of water quality. The regulation has clarified the activities which are included in the program and has incorporated administrative mechanisms to lessen the impacts of the regulation on affected Federal and State agencies, and on the public. To further refine the program the Corps will again need the help of the public and of State and Federal agencies in identifying activities and bodies of water that can be excluded from the Section 404 program without adverse impact on the chemical, physical, or biological integrity of the nation's waters.

We look forward to again working with the public and the State and Federal agencies on these further changes.

The Corps of Engineers wishes to take this opportunity to express its appreciation to every individual, organization, and governmental agency and representative that submitted comments during this rule-making exercise.

The Department of the Army, acting through the Corps of Engineers, is publishing herewith an interim final regulation which prescribes the policies, practice, and procedures to be followed in the processing of Department of the Army permits for activities in navigable or ocean waters including the discharge of dredged or fill material in navigable waters. Interim final regulations are being published in order to begin immediately to implement a permit program under Section 404 of the FWPCA in those waters which will be included in the Corps regulatory jurisdiction as a result of the decision in *NRDC* v. *Callaway*. However, while this regulation becomes effective July 25, 1975, there will be an additional comment period of 90 days in order that the public can comment further on any of its provisions. Thereafter, these comments will be reviewed and the regulation modified, if necessary.

The development of a permit program to regulate the discharge of dredged material and fill material in all waters of the United States has been the subject of intensive discussions between the Corps of Engineers and the Environmental Protection Agency since the decision in *NRDC* v. *Callaway*. We have worked together in an effort to develop a program that is manageable, responsive to the concerns of protecting vital national water resources from destruction through irresponsible and irreversible decisions, and sensitive to the often conflicting needs and desires of people who utilize these resources. We have attempted to create a program that recognizes the need to interweave all concerns of the public—environmental, social, and economic—in the decision-making process; that recognizes that present limitations on manpower preclude its immediate implementation throughout the country; and that we believe to be responsive to the overall objectives and needs of the Federal Water Pollution Control Act to the extent that the law now allows.

We recognize that this program, in its effort to protect water quality to the full extent of the commerce clause, will extend Federal regulation over discharges of dredged or fill material to many areas that have never before been subject to Federal permits or to this form of water quality protection. We therefore strongly urge the public to review and comment further on this interim final regulation in order that it can be modified, where necessary and legally permissible, to fully address your concerns, desires, goals, and objectives. To assist you in your analysis and understanding of this regulation, representatives from the Corps of Engineers intend to travel throughout the country during the next 90 days and conduct public hearings on this regulation. We urge your participation in these hearings when they are scheduled in your area.

As we move into this new program, we also urge your support and understanding. To the extent that enforcement of its provisions becomes necessary, the Corps of Engineers intends to request the Department of Justice and the Environmental Protection Agency to take appropriate action. However, we intend to pursue a reasonable enforcement program over these activities that have never before been subject to Federal regulation, relying initially on an intensive public information campaign to make the public aware of the requirements of Section 404 of the FWPCA. It is our desire and intention to work closely with the Department of Justice and the Environmental Protection Agency to achieve this purpose.

On May 6, 1975, the Environmental Protection Agency, in conjunction with the Department of the Army, published proposed guidelines for public comment which are required by section 404(b) of the FWPCA in the review of a permit application for the discharge of dredged or fill material. It is anticipated that final guidelines will be published about August 15, 1975. During the interim, the present procedures will be utilized by Corps District Engineers in the review of permit applications for the discharge of dredged or fill material in navigable waters.

There follows a brief discussion of the pertinent sections of this regulation which address the discharge of dredged or fill material in navigable waters:

Paragraph (d)(2): This paragraph defines the term "navigable waters" and in so doing identifies those waters of the United States which are subject to Corps Jurisdiction under section 404 of the FWPCA.

With respect to the coastal regions of the country, Corps jurisdiction would extend to all coastal waters subject to the ebb and flow of the tide shoreward to their mean high water mark (mean higher high water mark on the Pacific Coast) and also to all wetlands, mudflats, swamps, and similar areas which are contiguous or adjacent to coastal waters. This would include wetlands periodically inundated by saline or brackish waters that are characterized by the presence of salt water vegetation capable of growth and reproduction, and also wetlands (including marshes, shallows, swamps and similar areas) that are periodically inundated by freshwater and normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction. In months to come, we intend to publish a list of fresh, brackish, and salt water vegetation that can be used as one of the indicators in determining the extent of Corps jurisdiction in these areas.

With respect to the inland areas of the country, Corps jurisdiction under Section 404 of the FWPCA would extend to all rivers, lakes, and streams that are navigable waters of the United States, to all tributaries (primary, secondary, tertiary, etc.) of navigable waters of the United States, and to all interstate waters. In addition, Corps jurisdiction would extend to those waters located en-

tirely within one state that are utilized by interstate travelers for water related recreational purposes, or to remove fish for sale in interstate commerce, or for industrial purposes or the production of agricultural commodities sold or transported in interstate commerce. Corps jurisdiction over these water bodies would extend landward to their ordinary high water mark and up to their headwaters, as well as to all contiguous or adjacent wetlands to these waters which are periodically inundated by freshwater, brackish water, or salt water and are characterized by the prevalence of aquatic vegetation, as described in the preceding paragraph, that are capable of growth and reproduction. Manmade canals which are navigated by recreational or other craft are also included in this definition. Drainage and irrigation ditches have been excluded.

We realize that some ecologically valuable water bodies or environmentally damaging practices may have been omitted. To insure that these waters are also protected, we have given the District Engineer discretionary authority to also regulate them on a case by case basis.

Paragraph (d)(2)(ii): Several additional definitions amplify the definition of navigable waters and are expressed in this paragraph. "Ordinary high water mark", used as a measurement point to determine the extent of Federal jurisdiction in inland freshwater rivers, streams, and lakes that do not have wetlands contiguous or adjacent to them, is established as that point on shore which is inundated 25% of the time (derived by a flow duration curve based on available water stage data).

"Headwaters" has been defined as the point on a stream beyond which the flow of the water body is normally less than five cubic feet per second. However, other factors, such as the volume of flow and point and nonpoint source discharge characteristics in the area will also be considered in determining these limits. Finally, "lakes" have been defined to include all natural bodies of water greater than five acres in surface area and also all bodies of standing water created by impounding any navigable water. This would not include stock watering ponds and settling basins, other than those that result from the impoundment of a navigable water.

During the 90 day comment period, the public is urged to carefully review these various definitions, particularly with respect to "ordinary high water mark," "headwaters," and "lakes" and furnish comments and recommended revisions to assist in the development of a final definition of this term that is consistent with the goals and objectives of the FWPCA to protect water quality.

Paragraph (d)(4): The term "dredged material" has been defined to include any material that is excavated or dredged from any of the waters of the United States identified in the preceding paragraphs. It would not include material which is obtained from some other source beyond a water of the United States, and also would not include materials produced in normal farming, silvaculture, and ranching activities such as plowing, cultivating, seeding, and harvesting.

Paragraph (d)(5): The term "discharge of dredged material" has been added to the lists of definitions in an effort to clarify the types of activities that fall under this term. Under this definition, therefore, any material which is excavated or dredged from a navigable water and then reintroduced through a point source into a navigable water would fall under this term. The types of activities encompassed by this term would include the depositing into navigable waters of dredged material if it is placed alongside of a newly dredged canal which has been excavated in a wetland area. It would also include maintenance of these canals if excavated material is placed in navigable waters. Also included is the runoff or overflow from a contained land or water disposal area.

The term "discharge of dredged material" does not include the discharge of pollutants into navigable waters that occur during the subsequent land based processing of dredged material extracted for commercial use even though the operation of extracting the materials itself may require a permit from the Corps of Engineers under section 10 of the River and Harbor Act of 1899. Discharges of materials from land based commercial washing operations are regulated under section 402 of the FWPCA.

Paragraph (d)(6): The term "fill material" has been defined to mean any pollutant used to create fill in the traditional sense of replacing an aquatic area with dry land or changing the bottom elevation of a water body for any purpose. Again, materials resulting from normal farming, silviculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting for the production of food, fiber, and forest products, would not fall within this term. Farm conservation practices such as terracing, check dams and landleveling would also not be regulated unless they occur in navigable waters. In addition, maintenance or emergency reconstruction of existing structures such as dikes, dams, or levees, will not be regulated.

Paragraph (d)(7): A new term "discharge of fill material" has been added to identify the types of activities to be regulated under section 404 of the FPWCA if, and only if, they are performed in a navigable water as that term has been defined in the regulation and discussed in the preceding paragraphs. Those activities falling within this term include site development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection and/or reclamation devices such as riprap, groins, seawalls, breakwaters, and bulkheads and fills; beach nourishment; levees; sanitary landfills; backfill required for the placement of structures such as sewage treatment facilities, intake and outfall pipes associated with power plants, and subaqueous utility lines; and artificial reefs.

Paragraph (e)(2): In view of manpower and budgetary constraints it is necessary that this program be phased in over a two year period. Provision for such a phase-in approach exists in this paragraph. Thus, under Phase I, this regulation would become immediately operative in all coastal waters and contiguous or adjacent wetlands as well as inland rivers, lakes and streams that are navigable waters of the United States (which the Corps of Engineers is already regulating) and their contiguous or adjacent wetlands. In Phase II, which would begin on July 1, 1976, we would continue to regulate all of those discharges of dredged material occurring in those waters identified in Phase I, and also begin to regulate discharges of dredged or fill material in primary tributaries (the main stems of tributaries directly connecting to navigable waters of the United States), their contiguous or adjacent wetlands, and all lakes. Finally, in Phase III, all discharges of dredged or fill material in navigable waters would be regulated after July 1, 1977.

We believe that the initial thrust of this phase-in program will enable the protection of those wetland and water resources areas that are in immediate danger of being further destroyed through unregulated development. As we move to implement these phases, we will endeavor to utilize general categorical permits to the maximum possible extent relying on individual permit actions to regulate only those environmentally significant activities. We will also attempt to identify additional categories of activities which can be excluded at a later date.

Discharges of dredged or fill material that occur before a particular water body falls under a particular phase are permitted by the regulation in paragraph (e)(2)(i), provided certain prescribed conditions are met before the discharge occurs. Included in these conditions is the requirement to obtain a State water quality certification (or to have the State waive its right to so certify) and the requirement to certify under section 307 (c)(3) of the Coastal Zone Management Act of 1972 that the discharge will be in compliance with an approved coastal zone management program. This paragraph does not automatically exempt all discharges of dredged or fill material not covered by a particular phase from the permitting requirements of this regulation, for it still gives the District Engineer the option of exercising jurisdiction over any activity involving the discharge of dredged or fill material in those cases where the activity will have a significant impact on the environment.

Paragraph (e)(2)(iii): This paragraph "grandfathers" all discharges of dredged or fill material in waters other than navigable waters of the United States which were completed before the date of this regulation and also permits any discharge of dredged or fill material of less than 500 cubic yards which was commenced before the date of this regulation and is completed within six months. This 500 cubic yard exemption

to the requirements of this regulation only pertains to a single and complete project, and would not encompass cumulative discharges of dredged or fill material, each less than 500 cubic yards, in a large number of projects which comprise and are associated with a complete plan of development. The term "commenced" as used in this paragraph is satisfied if there has been some discharge of dredged or fill material at a specified disposal site or the entering into a written contract to do such before the date of the regulation. The "grandfathering" of these activities does not avoid the legal requirement to comply with the State water quality certification requirements of section 401 of the FWPCA or to furnish a coastal zone management certification, however.

Paragraph (e)(2)(iv): This paragraph permits, (without the need for the processing of a individual permit application through the procedures in the regulation), minor bulkheads and fills that are constructed in waters other than navigable waters of the United States provided they are less than 500 feet in length, constructed for property protection, and involve the discharge of less than an average of one cubic yard per running foot. However, while these types of discharges are permitted through the regulation, conditions have also been imposed that must be met before the discharge can occur (including the need to obtain a water quality certification and furnish a coastal zone management certification). In addition, the District Engineer can still exercise jurisdiction over these activities in those cases where he determines that the discharge will have a significant impact on the environment.

We believe that this administrative mechanism of authorizing this type of activity through the regulation is essential in order to make this program manageable from a manpower and resources point of view, and still protect the aquatic environment. In addition, it serves as a mechanism to alleviate the administrative burdens which are encountered in the normal processing of individual permits. To this end, we intend to rely heavily on the general public to bring to the attention of the District Engineer those minor bulkhead and fill activities which, while falling within the protection of this paragraph, should be regulated on a case by case basis.

Paragraph (e)(4): Activities of Federal agencies that involve the discharge of dredged material or of fill material into navigable waters are not exempt from the provisions of this regulation. Activities of the Corps of Engineers involving such discharges are reviewed and regulated pursuant to the policies and procedures expressed in Title 33 of the Code of Federal Regulations, Part 209.145.

Paragraph (f)(3): We believe there is considerable merit in having the States become directly involved in the decision-making process to the maximum extent possible under the law. Indeed, many states already have ongoing permit programs which address many, and, in some cases all, of the concerns which are addressed in the Corps decision-making process. Three ways will be used to involve the States in this decision-making process. We have embodied these three mechanisms in an effort to make the program manageable and publicly acceptable, and in response to the overwhelming number of comments which supported the basic concept.

First, since each discharge of dredged or fill material into a navigable water is, in effect, the discharge of a pollutant into the water, a State water quality certification is required under section 401 of the FWPCA before that discharge can be lawfully undertaken. Provision has therefore been made in the opening paragraph of this section to indicate this legal requirement. Thus, any State may cause the denial of a section 404 permit if it chooses to deny a water quality certification. Similar situations also exist in those states with approved coastal zone management plans: An individual in states with such plans must also certify that his activity will comply with the approved plan. On the other hand, where the state does not have such a certification program or delays the processing of its certification, we will still begin to process the section 404 permit. In absence of a timely response from the State, the section 404 permit will be processed to a conclusion.

Second, we are mindful that many states have existing permit programs to regulate the same types of activities that will be regulated through section 404 of the FWPCA by the Corps of Engineers. To the extent possible, it is our desire to support the state in its decision. Thus, where a state denies a permit, the Corps will not issue a section 404 permit. On the other hand, if a state issues a permit, the Corps would not deny its permit unless there are overriding national factors of the public interest which dictate such action. We believe that this type of situation can be kept to a minimum provided the State's permit program has built into it the policies, procedures, goals, requirements, and objectives embodied in the Corps permit program and the national legislation which molded and supports it. This would include, for example, the concerns and requirements of the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Coastal Zone Management Act, and the FWPCA. In view of this objective, a section 404 permit will generally be issued following a favorable State determination unless overriding national factors of the public interest are revealed during the final processing of the section 404 permit application and provided the concerns, policies, goals, and requirements expressed in the above cited statutes, the Corps policies, and the guidelines have been addressed. In those States without any type of permit program to regulate the types of activities envisioned by section 404, we believe that the objectives expressed in this subparagraph should give them guidance in the formulation of their respective programs should they choose to do so.

Finally, provision has been made in subparagraph (v) of this section to allow the District Engineer to enter into an agreement with those States having ongoing permit programs which would enable joint processing of the Department of the Army and the state permit application to an independent conclusion by each entity. This would include joint public notices, joint public hearings, and the joint development, review, and analysis of information which leads to the final decision on a permit application. We strongly encourage States to work with our District Engineers in this effort for we feel that this is a valuable mechanism to make this program manageable and publicly acceptable as well as a means to avoid unnecessary duplication of effort.

Paragraph (i)(2)(ix): We have also adopted a procedure, found in this paragraph, to process general permits for certain clearly described categories. A general permit once issued would preclude the need for any further permit for similar work and would prescribe conditions to be followed in the future performance of such work. We hope this mechanism will go far in making our entire regulatory program administratively manageable, and we will attempt to use the general permit for many categories in Phases II and III prior to the effective date of those phases. We intend to urge our District Engineers to utilize this mechanism as often as possible, and we request that those Federal agencies, organizations, and members of the public who review and comment on public notices for general permits do so in a spirit of cooperation, constructive criticism and suggestion.

During the next 90 days, comments addressing this interim final regulation should be submitted in writing to the Chief of Engineers, Forrestal Building, Washington, D.C. 20314, ATTN: DAEN-CWO-N.

It is hereby certified that the economic and inflationary impacts of this regulation have been carefully evaluated in accordance with OMB Circular A-107.

Dated: July 22, 1975.

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§ 209.120 Permits for activities in Navigable Waters or Ocean Waters.

(a) *Purpose.* This regulation prescribes the policy, practice, and procedure to be followed by all Corps of Engineers installations and activities in connection with applications for permits authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into navigable waters, and the transportation of dredged material for the purpose of dumping it into ocean waters.

(b) *Laws requiring authorization of structures or work.* (1) Section 9 of the

River and Harbor Act approved March 3, 1899 (30 Stat. 1151; 33 U.S.C. 401) prohibits the construction of any dam or dike across any navigable water of the United States in the absence of Congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the Army. Where the navigable portions of the waterbody lie wholly within the limits of a single State, the structure may be built under authority of the legislature of that State, if the location and plans or any modification thereof, are approved by the Chief of Engineers and by the Secretary of the Army. The instrument of authorization is designated a permit. Section 9 also pertains to bridges and causeways but the authority of the Secretary of the Army and Chief of Engineers with respect to bridges and causeways was transferred to the Secretary of Transportation under the Department of Transportation Act on October 16, 1966 (80 Stat. 941, 49 U.S.C. 1165g(6)(A)).

(2) Section 10 of the River and Harbor Act approved March 3, 1899 (30 Stat. 1151; 33 U.S.C. 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over any navigable water of the United States, the excavation from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters are unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit or letter of permission. The authority of the Secretary of the Army to prevent obstructions to navigation in the navigable waters of the United States was extended to artificial islands and fixed structures located on the outer continental shelf by section 4(f) of the Outer Continental Shelf Lands Act of 1953 (67 Stat. 463; 43 U.S.C. 1333(f)).

(3) Section 11 of the River and Harbor Act approved March 3, 1899 (30 Stat. 1151; 33 U.S.C. 404) authorizes the Secretary of the Army to establish harbor lines channelward of which no piers, wharves, bulkheads, or other works may be extended or deposits made without approval of the Secretary of the Army. Regulations (ER 1145-2-304) have been promulgated relative to this authority and published at § 209.150. By policy stated in those regulations effective May 27, 1970, harbor lines are guidelines only for defining the offshore limits of structures and fills insofar as they impact on navigation interests. Except as provided in paragraph (e)(1) of this section below, permits for work shoreward of those lines must be obtained in accordance with section 10 of the same Act, cited above.

(4) Section 13 of the River and Harbor Act approved March 3, 1899 (30 Stat. 1152; 33 U.S.C. 407) provides that the Secretary of the Army, whenever the Chief of Engineers determines that anchorage and navigation will not be injured thereby, may permit the discharge of refuse into navigable waters. In the absence of a permit, such discharge of refuse is prohibited. While the prohibition of this section, known as the Refuse Act, is still in effect, the permit authority of the Secretary of the Army has been superseded by the permit authority provided the Administrator, Environmental Protection Agency, under sections 402 and 405 of the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816, 33 U.S.C. 1342 and 1345).

(5) Section 14 of the River and Harbor Act approved March 3, 1899 (30 Stat. 1152; 33 U.S.C. 408) provides that the Secretary of the Army on the recommendation of the Chief of Engineers may grant permission for the temporary occupation or use of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States. This permission will be granted by an appropriate real estate instrument in accordance with existing real estate regulations.

(6) Section 1 of the River and Harbor Act of June 13, 1902 (32 Stat. 371; 33 U.S.C. 565) allows any persons or corporations desiring to improve any navigable river at their own expense and risk to do so upon the approval of the plans and specifications by the Secretary of the Army and the Chief of Engineers. Improvements constructed under this authority, which are primarily in Federal project areas, remain subject to the control and supervision of the Secretary of the Army and the Chief of Engineers. The instrument of authorization is designated a permit.

(7) Section 404 of the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816, 33 U.S.C. 1344) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into the navigable waters at specified disposal sites. The selection of disposal sites will be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. Furthermore, the Administrator can prohibit or restrict the use of any defined area as a disposal site whenever he determines, after notice and opportunity for public hearings, that the discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shell fish beds and fishery areas, wildlife or recreational areas.

(8) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (PL 92-532, 86 Stat. 1052, 33 U.S.C. 1413) authorizes the Secretary of the Army to issue permits, after notice and opportunity for public hearings, for the transportation of dredged material for the purpose of dumping it in ocean waters. However, similar to the EPA Administrator's limiting authority cited in paragraph (b)(7) of this section, the Administrator can prevent the issuance of a permit under this authority if he finds that the dumping of the material will result in an unacceptable adverse impact on municipal water supplies, shellfish beds, wildlife, fisheries or recreational areas.

(9) The New York Harbor Act of June 29, 1888, as amended (33 U.S.C. 441 et seq.) provides for the issuance of permits by the Supervisors of the New York, Baltimore, and Hampton Roads Harbors for the transportation upon and/or discharge in those harbors of a variety of materials including dredgings, sludge and acid. The District Engineers of New York, Baltimore and Norfolk have been designated the Supervisors of these harbors, respectively. However, section 511 (b) of the Federal Water Pollution Control Act (PL 92-500, 86 Stat. 816) provides that the discharge of these materials into navigable waters shall be regulated pursuant to that Act and not the New York Harbor Act except as to the effect on navigation and anchorage. In addition, section 106(a) of the Marine Protection, Research and Sanctuaries Act of 1972 (PL 92-532, 86 Stat. 1052) provides that all permits for discharges in ocean waters shall only be issued in accordance with the Act after April 23, 1973. Therefore, the supervisors of these three harbors will no longer issue permits under the authority of the New York Harbor Act, as amended, for transportation and/or discharge of these materials.

(c) *Related Legislation.* (1) Section 401 of the Federal Water Pollution Control Act (PL 92-500; 86 Stat. 816, 33 U.S.C. 1411) requires any applicant for a Federal license or permit to conduct any activity which may result in a discharge into navigable waters to obtain a certification from the State in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable waters at the point where the discharge originates or will originate, that the discharge will comply with the applicable effluent limitations and water quality standards. A certification obtained for the construction of any facility must also pertain to the subsequent operation of the facility.

(2) Section 307(c)(3) of the Coastal Zone Management Act of 1972 (PL 92-583, 86 Stat. 1280, 16 U.S.C. 1456(c)(3)) requires any applicant for a Federal license or permit to conduct an activity affecting land or water uses in the State's coastal zone to furnish a certification that the proposed activity will comply with the State's coastal zone management program. Generally, no permit will be issued until the State has concurred with the applicant's certification. This provision becomes effective upon approval by the Secretary of Commerce of the State's coastal zone management program.

(3) Section 302 of the Marine Protection, Research, and Sanctuaries Act of 1972 (Pub. L. 92-532, 86 Stat. 1052, 16 U.S.C. 1432) authorizes the Secretary of Commerce, after consultation with other interested Federal agencies and with the approval of the President, to designate as marine sanctuaries those areas of the ocean waters or of the Great Lakes and their connecting waters or of other coastal waters which he determines necessary for the purpose of preserving or

restoring such areas for their conservation, recreational, ecological, or esthetic values. After designating such an area, the Secretary of Commerce shall issue regulations to control any activities within the area. Activities in the sanctuary authorized under other authorities are valid only if the Secretary of Commerce certifies that the activities are consistent with the purposes of Title III of the Act and can be carried out within the regulations for the sanctuary.

(4) The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347) declares the national policy to encourage a productive and enjoyable harmony between man and his environment. Section 102 of that Act directs that "to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall * * * insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations * * *." See also paragraph (l)(1) of this section on environmental statements.

(5) The Fish and Wildlife Act of 1956 (16 U.S.C. 742a, et seq.), the Migratory Marine Game-Fish Act (16 U.S.C. 760c–760g) and the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c) and other acts express the concern of Congress with the quality of the aquatic environment as it affects the conservation, improvement and enjoyment of fish and wildlife resources. Reorganization Plan No. 4 of 1970 transferred certain functions, including certain fish and wildlife-water resources coordination responsibilities, from the Secretary of the Interior to the Secretary of Commerce. Under the Fish and Wildlife Coordination Act and Reorganization Plan No. 4, any Federal Agency which proposes to control or modify any body of water must first consult with the United States Fish and Wildlife Service, the National Marine Fisheries Service, as appropriate, and with the head of the appropriate State agency exercising administration over the wildlife resources of the affected State.

(6) The Federal Power Act of 1920 (41 Stat. 1063; 16 U.S.C. 791a et seq.), as amended, authorizes the Federal Power Commission (FPC) to issue licenses for the construction, operation and maintaining of dams, water conduits, reservoirs, power houses, transmission lines, and other physical structures of a power project. However, where such structures will affect the navigable capacity of any navigable waters of the United States (as defined in 16 U.S.C. 796), the plans for the dam or other physical structures affecting navigation must be approved by the Chief of Engineers and the Secretary of the Army. In such cases, the interests of navigation should normally be protected by a recommendation to the FPC for the inclusion of appropriate provisions in the FPC license rather than the issuance of a separate Department of the Army permit under 33 U.S.C. 401 et seq. As to any other activities in navigable waters not constituting construction, operation and maintenance of physical structures licensed by the FPC under the Federal Power Act of 1920, as amended, the provisions of 33 U.S.C. 401 et seq. remain fully applicable. In all cases involving the discharge of dredged or fill material into navigable waters or the transportation of dredged material for the purpose of dumping in ocean waters, Department of the Army permits under section 404 of the Federal Water Pollution Control Act, or under section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 will be required.

(7) The National Historic Preservation Act of 1966 (80 Stat. 915, 16 U.S.C. 470) created the Advisory Council on Historic Preservation to advise the President and Congress on matters involving historic preservation. In performing its function the Council is authorized to review and comment upon activities licensed by the Federal Government which will have an effect upon properties listed in the National Register of Historic Places.

(8) The Interstate Land Sales Full Disclosure Act (15 U.S.C. 1701 et seq.) prohibits any developer or agent from selling or leasing any lot in a subdivision unless the purchaser is furnished in advance a printed property report including information which the Secretary of Housing and Urban Development may, by rules or regulations, require for the protection of purchasers. In the event the lot in question is in a wetlands area, the report is required by Housing and Urban Development regulation to state that no permit has been granted by the Corps of Engineers for the development under Section 10 of the River Harbor Act of 1899.

(9) The Water Resources Planning Act (42 U.S.C. 1962 et seq.) provides for the possible establishment upon request of the Water Resources Council or a State of river basin water and related land resources commissions. Each such commission shall coordinate Federal, State, interstate, local and nongovernmental plans for the development of water and related land resources in its area, river basin, or group of river basins. In the event the proposed Corps of Engineers permits to non-governmental developers or other agencies under section 10 of the River and Harbor Act of 1899 and section 404 of the Federal Water Pollution Control Act may affect the plans of such river basin commissions, the permits will be coordinated with the appropriate concerned river basin commissions. The same is true of Corps of Engineers authorizations to private persons or corporations to improve navigable rivers at their own expense under section 1 of the River and Harbor Act of 1902.

(d) Definitions. For the purpose of issuing or denying authorizations under this regulation.

(1) *"Navigable waters of the United States."* The term, "navigable waters of the United States," is administratively defined to mean waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate commerce landward to their ordinary high water mark and up to the head of navigation as determined by the Chief of Engineers, and also waters that are subject to the ebb and flow of the tide shoreward to their mean high water mark (mean higher high water mark on the Pacific Coast). See 33 CFR 209.260 (ER 1165-2-302) for a more definitive explanation of this term.

(2) *"Navigable waters".* (i) The term, "navigable waters," as used herein for purposes of Section 404 of the Federal Water Pollution Control Act, is administratively defined to mean waters of the United States including the territorial seas with respect to the disposal of fill material and excluding the territorial seas with respect to the disposal of dredged material and shall include the following waters:

(*a*) Coastal waters that are navigable waters of the United States subject to the ebb and flow of the tide, shoreward to their mean high water mark (mean higher high water mark on the Pacific coast);

(*b*) All coastal wetlands, mudflats, swamps, and similar areas that are contiguous or adjacent to other navigable waters. "Coastal wetlands" includes marshes and shallows and means those areas periodically inundated by saline or brackish waters and that are normally characterized by the prevalence of salt or brackish water vegetation capable of growth and reproduction;

(*c*) Rivers, lakes, streams, and artificial water bodies that are navigable waters of the United States up to their headwaters and landward to their ordinary high water mark;

(*d*) All artificially created channels and canals used for recreational or other navigational purposes that are connected to other navigable waters, landward to their ordinary high water mark;

(*e*) All tributaries of navigable waters of the United States up to their headwaters and landward to their ordinary high water mark;

(*f*) Interstate waters landward to their ordinary high water mark and up to their headwaters;

(*g*) Intrastate lakes, rivers and streams landward to their ordinary high water mark and up to their headwaters that are utilized:

(*1*) By interstate travelers for water-related recreational purposes;

(*2*) For the removal of fish that are sold in interstate commerce;

(*3*) For industrial purposes by industries in interstate commerce; or

(*4*) In the production of agricultural commodities sold or transported in interstate commerce;

(*h*) Freshwater wetlands including marshes, shallows, swamps and, similar areas that are contiguous or adjacent to other navigable waters and that support freshwater vegetation. "Freshwater wetlands" means those areas that are periodically inundated and that are normally characterized by the prevalence of vegetation that requires saturated soil

conditions for growth and reproduction; and

(i) Those other waters which the District Engineer determines necessitate regulation for the protection of water quality as expressed in the guidelines (40 CFR 230). For example, in the case of intermittent rivers, streams, tributaries, and perched wetlands that are not contiguous or adjacent to navigable waters identified in paragraphs (a)-(h), a decision on jurisdiction shall be made by the District Engineer.

(ii) The following additional terms are defined as follows:

(a) *"Ordinary high water mark"* with respect to inland fresh water means the line on the shore established by analysis of all daily high waters. It is established as that point on the shore that is inundated 25% of the time and is derived by a flow-duration curve for the particular water body that is based on available water stage data. It may also be estimated by erosion or easily recognized charactertistics such as shelving, change in the character of the soil, destruction of terrestrial vegetation or its inability to grow, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area;

(b) *"Mean high water mark"* with respect to ocean and coastal waters means the line on the shore established by the average of all high tides (all higher high tides on the Pacific Coast). It is established by survey based on available tidal data (preferably averaged over a period of 18.6 years because of the variations in tide). In the absence of such data, less precise methods to determine the mean high water mark may be used, such as physical markings or comparison of the area in question with an area having similar physical characteristics for which tidal data are already available;

(c) *"Lakes"* means natural bodies of water greater than five acres in surface area and all bodies of standing water created by the impounding of navigable waters identified in paragraphs (a)-(h), above. Stock watering ponds and settling basins that are not created by such impoundments are not included;

(d) *"Headwaters"* means the point on the stream above which the flow is normally less than 5 cubic feet per second; *provided, however,* the volume of flow, point and nonpoint source discharge characteristics of the watershed, and other factors that may impact on the water quality of waters of the United States will be considered in determining this upstream limit; and

(e) *"Primary tributaries"* means the main stems of tributaries directly connecting to navigable waters of the United States up to their headwaters and does not include any additional tributaries extending off of the main stems of these tributaries.

(3) *"Ocean waters"*. The term "ocean waters," as defined in the Marine Protection, Research, and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1052), means those waters of the open seas lying seaward of the base line from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639).

(4) *"Dredged material"*. The term "dredged material" means material that is excavated or dredged from navigable waters. The term does not include material resulting from normal farming, silvaculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting, for production of food, fiber, and forest products.

(5) *"Discharge of dredged material"*. The term "discharge of dredged material" means any addition of dredged material, in excess of one cubic yard when used in a single or incidental operation, into navigable waters. The term includes, without limitation, the addition of dredged material to a specified disposal site located in navigable waters and the runoff or overflow from a contained land or water disposal area. Discharges of pollutants into navigable waters resulting from the onshore subsequent processing of dredged material that is extracted for any commercial use (other than fill) are not included within this term and are subject to section 402 of the Federal Water Pollution Control Act even though the extraction of such material may require a permit from the Corps of Engineers under section 10 of the River and Harbor Act of 1899.

(6) *"Fill material."* The term "fill material" means any pollutant used to create fill in the traditional sense of replacing an aquatic area with dry land or of changing the bottom elevation of a water body for any purpose. "Fill material" does not include the following:

(i) Material resulting from normal farming, silvaculture, and ranching activities, such as plowing, cultivating, seeding, and harvesting, for the production of food, fiber, and forest products;

(ii) Material placed for the purpose of maintenance, including emergency reconstruction of recently damaged parts of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, and bridge abutments or approaches, and transportation structures.

(iii) Additions to these categories of activities that are not "fill" will be considered periodically and these regulations amended accordingly.

(7) *"Discharge of fill material."* The term "discharge of fill material" means the addition of fill material into navigable waters for the purpose of creating fastlands, elevations of land beneath navigable waters, or for impoundments of water. The term generally includes, without limitation, the following activities: placement of fill that is necessary to the construction of any structure in a navigable water; the building of any structure or impoundment requiring rock, sand, dirt, or other pollutants for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands, property protection and/or reclamation devices such as riprap, groins, seawalls, breakwalls, and bulkheads and fills; beach nourishment; levees; sanitary landfills; fill for structures such as sewage treatment facilities, intake and outfall pipes associated with power plants, and subaqueous utility lines; and artificial reefs.

(8) *"Person"*. The term "person" means any individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, any interstate body, or any agency or instrumentality of the Federal Government, other than the Corps of Engineers (see 33 CFR 209.145 for procedures for Corps projects).

(9) *"Coastal zone."* The term "coastal zone" means the coastal waters and adjacent shorelands designated by a State as being included in its approved coastal zone management program under the Coastal Zone Management Act of 1972.

(e) *Activities Requiring Authorizations.* (1) Structures or work in navigable waters of the United States. Department of the Army authorizations are required under the River and Harbor Act of 1899 (See paragraph (b) of this section) for all structures or work in navigable waters of the United States except for bridges and causeways (see Appendix A), the placement of aids to navigation by the U.S. Coast Guard, structures constructed in artificial canals within principally residential developments where the canal has been connected to a navigable water of the United States (see paragraph (g)(11) below), and activities that were commenced or completed shoreward of established harbor lines before May 27, 1970 (see 33 CFR § 209.150) other than those activities involving the discharge of dredged or fill material in navigable waters after October 18, 1972.

(i) Structures or work are in the navigable waters of the United States if they are within limits defined in 33 CFR 209.260. Structures or work outside these limits are subject to the provisions of law cited in paragraph (b) of this section if those structures or work affect the course, location, or condition of the water body in such a manner as to significantly impact on the navigable capacity of the water body. A tunnel or other structure under a navigable water of the United States is considered to have a significant impact on the navigable capacity of the water body.

(ii) Structures or work licensed under the Federal Power Act of 1920 do not require Department of the Army authorizations under the River and Harbor Act of 1899 (see paragraphs (b) and (c) of this section); provided, however, that any part of such structures or work that involves the discharge of dredged or fill material into navigable waters or the transportation of dredged material for the purpose of dumping it into ocean waters will require Department of the Army authorization under Section 404 of the Federal Water Pollution Control Act and Section 103 of the Marine Protection, Research, and Sanctuaries Act, as appropriate.

(2) *Discharges of dredged material or of fill material into navigable waters.* (i)

Except as provided in subparagraphs (ii) and (iii) below, Department of the Army permits will be required for the discharge of dredged material or of fill material into navigable waters in accordance with the following phased schedule:

(*a*) *Phase I:* After the effective date of this regulation, discharges of dredged material or of fill material into coastal waters and coastal wetlands contiguous or adjacent thereto or into inland navigable waters of the United States and freshwater wetlands contiguous or adjacent thereto are subject to the procedures of this regulation.

(*b*) *Phase II:* After July 1, 1976, discharges of dredged material or of fill material into primary tributaries, freshwater wetlands contiguous or adjacent to primary tributaries, and lakes are subject to the procedures of this regulation.

(*c*) *Phase III:* After July 1, 1977, discharges of dredged material or of fill material into any navigable water are subject to the procedures of this regulation.

(ii) All other discharges of dredged or fill material that occur before the dates specified in subparagraphs (i) (*b*) and (*c*) above, are hereby permitted for purposes of Section 404 of the Federal Water Pollution Control Act without further processing under this regulation; *provided, however,* That the procedures of this regulation including those pertaining to individual and general permits (see paragraph (i)(2)(ix), below) shall apply to any discharge(s) of dredged or fill material if the District Engineer determines that the water quality concerns as expressed in the guidelines (see 40 CFR 230) indicate the need for such action; and *further provided,* That the following conditions are met:

(*a*) That a water-quality certification under section 401 of the Federal Water Pollution Control Act (see paragraph (c)(1) of this section) is obtained before the discharge is commenced or the State has waived its right to so certify;

(*b*) That a certification of compliance with a State's approved coastal zone management program pursuant to section 307(c)(3) of the Coastal Zone Management Act (see paragraph (c)(2), above), is furnished, if applicable, before the discharge is commenced;

(*c*) That the discharge will not be located in the proximity of a public water supply intake;

(*d*) That the discharge will not contain unacceptable levels of pathogenic organisms in areas used for sports involving physical contact with the water;

(*e*) That the discharge will not occur in areas of concentrated shellfish production; and

(*f*) That the discharge will not destroy or endanger the critical habitat of a threatened or endangered species, as identified under the Endangered Species Act.

(iii) Discharges of dredged or fill material in waters other than navigable waters of the United States that have been completed by the effective date of this regulation and discharges of dredged or fill material of less than 500 cubic yards into waters other than navigable waters of the United States that are part of an activity that was commenced before the publication of this regulation, that will be completed within six months of the publication of this regulation, and that involves a single and complete project and not a number of projects associated with complete development plans are hereby authorized for purposes of Section 404 of the Federal Water Pollution Control Act without further processing under this regulation; *provided, however,* That the exemption of these types of activities from the requirements of this regulation shall not be construed as a waiver of the requirement to obtain a State water-quality certification under section 401 of the Federal Water Pollution Control Act or a certification of compliance with a State's approved coastal zone management program pursuant to section 307(c)(3) of the Coastal Zone Management Act in those cases where the discharge of dredged or fill material has not been completed by the date of this regulation; and *further provided,* That the procedures of this regulation shall apply to any activity involving the discharge of dredged or fill material commenced before the date of this regulation if the District Engineer determines that the interests of water quality as expressed in the guidelines (see 40 CFR Part 230) so require. The term "commenced" as used herein shall be satisfied if there has been, before the date of this regulation, some discharge of dredged or fill material into the navigable water as a part of the above activity or an entering into of a written contractual obligation to have the dredged or fill material discharged at a designated disposal site by a contractor.

(iv) All bulkhead and fill activities involving discharges of dredged material or of fill material in navigable waters other than navigable waters of the United States that are less than 500 feet in length, are constructed for property protection, and involve less than an average of one cubic yard per running foot are hereby permitted for purposes of section 404 of the Federal Water Pollution Control Act without further processing under this regulation; *provided, however,* That the procedures of this regulation including those pertaining to individual and general permits (see paragraph (i)(2)(ix), below) shall apply to any discharge(s) of dredged or fill material if the District Engineer determines that the water-quality concerns as expressed in the guidelines (see 40 CFR 230) indicate the need for such action; and *further provided,* That the conditions specified in subparagraph (ii) (*a*)-(*f*) are met.

(3) *Transportation of dredged material for the purpose of dumping it in ocean waters and construction of artificial islands and fixed structures on the outer continental shelf.* Department of the Army authorizations are required for the transportation of dredged material for the purpose of dumping it in ocean waters and construction of artificial islands and fixed structures on the outer continental shelf pursuant to Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 and Section 4(f) of the Outer Continental Shelf Lands Act, respectively.

(4) *Activities of Federal Agencies.* Except as specifically provided in this subparagraph, activities of the type described in paragraph (e)(1), (2), and (3) of this section done by or on behalf of any Federal agency, other than the Corps of Engineers, are subject to the authorization procedures of this regulation. Agreement for construction or engineering services performer for other agencies by the Corps of Engineers do not constitute authorization under the regulation. Division and District Engineers will therefore advise Federal agencies accordingly and cooperate to the fullest extent in the expediting processing of their applications.

(i) By section 10 of the Act of March 3, 1899 (see paragraph (b)(2) above), Congress has delegated to the Secretary of the Army and the Chief of Engineers the duty of authorizing or prohibiting certain work or structures in navigable waters of the United States. The general legislation by which Federal agencies are empowered to act generally is not considered to be sufficient authorization by Congress to satisfy the purposes of section 10. If an agency asserts that it has Congressional authorization meeting the test of section 10 or would otherwise be exempt from the provisions of section 10, the legislative history and/or provisions of the Act should clearly demonstrate that Congress was approving the exact location and plans from which Congress could have considered the effect on navigable waters of the United States or that Congress intended to exempt that agency from the requirements of section 10. Very often such legislation reserves final approval of plans or construction for the Chief of Engineers. In such cases, evaluation and authorization under this regulation are limited by the intent of the statutory language involved.

(ii) The policy provisions set out in paragraph (f)(3) of this section, relating to State or local authorizations, do not apply to work or structures undertaken by Federal agencies except where compliance with non-Federal authorization is required by Federal law or Executive policy. Federal agencies are required to comply with the substantive State, interstate, and local water-quality standards and effluent limitations as are applicable by law that are adopted in accordance with or effective under the provisions of the Federal Water Pollution Control Act, as amended, in the design, construction, management, operation, and maintenance of their respective facilities. (See Executive Order No. 11752, dated 17 Dec. 73.) They are not required, however, to obtain and provide certification of compliance with effluent limitations and water-quality standards from State or interstate water pollution control agencies in connection with activities involving discharges into navigable waters.

(f) *General Policies for Evaluating Permit Applications.* (1) The decision

whether to issue a permit will be based on an evaluation of the probable impact of the proposed structure or work and its intended use on the public interest. Evaluation of the probable impact that the proposed structure or work may have on the public interest requires a careful weighing of all those factors that become relevant in each particular case. The benefit that reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. The decision whether to authorize a proposal and, if authorized, the conditions under which it will be allowed to occur, are therefore determined by the outcome of the general balancing process (e.g., see § 209.400, Guidelines for Assessment of Economic, Social and Environmental Effects of Civil Works Projects). That decision should reflect the national concern for both protection and utilization of important resources. All factors that may be relevant to the proposal must be considered; among those factors are conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood-damage prevention, land-use classifications, navigation, recreation, water supply, water quality, and, in general, the needs and welfare of the people. No permit will be granted unless its issuance is found to be in the public interest.

(2) The following general criteria will be considered in the evaluation of every application:

(i) The relative extent of the public and private need for the proposed structure or work.

(ii) The desirability of using appropriate alternative locations and methods to accomplish the objective of the proposed structure or work.

(iii) The extent and permanence of the beneficial and/or detrimental effects that the proposed structure or work may have on the public and private uses to which the area is suited.

(iv) The probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated structures or work in the general area.

(3) Permits will not be issued where certification or authorization of the proposed work is required by Federal, State, and/or local law and that certification or authorization has been denied. Initial processing of an application for a Department of the Army permit will proceed until definitive action has been taken by the responsible State agency to grant or deny the required certification and/or authorization. Where the required State certification and/or authorization has been denied and procedures for reconsideration exist, reasonable time not to exceed 90 days will be allowed for the applicant to attempt to resolve the problem and/or obtain reconsideration of the denial. If the State denial of authorization cannot be thus resolved, the application will be denied in accordance with paragraph (p) of this section.

(i) Where officially adopted State, regional, or local land-use classifications, determinations, or policies are applicable to the land or water areas under consideration, they shall be presumed to reflect local factors of the public interest and shall be considered in addition with the other national factors of the public interest identified in paragraph (f)(1), above.

(ii) A proposed activity in a navigable water may result in conflicting comments from several agencies within the same State. While many States have designated a single State agency or individual to provide a single and coordinated State position regarding pending permit applications, where a State has not so designated a single source, District Engineers will elicit from the Governor an expression of his views and desires concerning the application (see also paragraph (j)(3), below) or, in the alternative, an expression from the Governor as to which State agency represents the official State position in this particular case. Even if official certification and/or authorization is not required by State or Federal law, but a State, regional, or local agency having jurisdiction or interest over the particular activity comments on the application, due consideration shall be given to those official views as a reflection of local factors of the public interest.

(iii) If a favorable State determination is received, the District Engineer will process the application to a conclusion in accordance with the policies and procedures of this regulation. In the absence of overriding national factors of the public interest that may be revealed during the subsequent processing of the permit application, a permit will generally be issued following receipt of a favorable State determination provided the concerns, policies, goals, and requirements as expressed in paragraphs (f) (1) and (2), above, the guidelines (40 CFR 230), and the following statutes have been followed and considered: the National Environmental Policy Act; the Fish and Wildlife Coordination Act; the Historical and Archaeological Preservation Act; the National Historic Preservation Act; the Endangered Species Act; the Coastal Zone Management Act; the Marine Protection, Research, and Sanctuaries Act of 1972; and the Federal Water Pollution Control Act (see paragraph c, above).

(iv) If the responsible State agency fails to take definitive action to grant or deny required authorizations or to furnish comments as provided in subparagraph (ii) above within six months of the issuance of the public notice, the District Engineer shall process the application to a conclusion.

(v) The District Engineer may, in those States with ongoing State permit programs for work or structures in navigable waters of the United States or the discharge of dredged or fill material in navigable waters, enter into an agreement with the States to jointly process and evaluate Department of the Army and State permit applications. This may include the issuance of joint public notices; the conduct of joint public hearings, if held; and the joint review and analysis of information and comments developed in response to the public notice, public hearing, the environmental assessment and the environmental impact statement (if necessary), the Fish and Wildlife Coordination Act, the Historical and Archaeological Preservation Act, the National Historic Preservation Act, the Endangered Species Act, the Coastal Zone Management Act, the Marine Protection, Research, and Sanctuaries Act of 1972, and the Federal Water Pollution Control Act. In such cases, applications for Department of the Army permits may be processed concurrently with the processing of the State permit to an independent conclusion and decision by the District Engineer and appropriate State agency.

(4) The District Engineer shall consider the recommendations of the appropriate Regional Director of the Bureau of Sport Fisheries and Wildlife, the Regional Director of the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration, the Regional Administrator of the Environmental Protection Agency, the local representative of the Soil Conservation Service of the Department of Agriculture, and the head of appropriate State agencies in administering the policies and procedures of the regulation.

(g) *Policies on particular factors of consideration.* In applying the general policies cited above to the evaluation of a permit application, Corps of Engineers officials will also consider the following policies when they are applicable to the specific application:

(1) *Interference with adjacent properties or water resource projects.* Authorization of work or structures by the Department of the Army does not convey a property right, nor authorize any injury to property or invasion of other rights.

(i)(*a*) Because a landowner has the general right to protect his property from erosion, applications to erect protective structures will usually receive favorable consideration. However, if the protective structure may cause damage to the property of others, the District Engineer will so advise the applicant and inform him of possible alternative methods of protecting his property. Such advice will be given in terms of general guidance only so as not to compete with private engineering firms nor require undue use of government resources. A significant probability of resulting damage to nearby properties can be a basis for denial of an application.

(*b*) A landowner's general right of access to navigable waters is subject to the similar rights of access held by nearby landowners and to the general public's right of navigation on the water surface. Proposals which create undue interference with access to, or use of, navigable waters will generally not receive favorable consideration.

(ii)(*a*) Where it is found that the work for which a permit is desired may interfere with a proposed civil works project

of the Corps of Engineers, the applicant and the party or parties responsible for fulfillment of the requirements of local cooperation should be apprised in writing of the fact and of the possibility that a civil works project which may be constructed in the vicinity of the proposed work might necessitate its removal or reconstruction. They should also be informed that the United States will in no case be liable for any damage or injury to the structures or work authorized which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claims or right to compensation will accrue from any such damage.

(*b*) Proposed activities which are in the area of a civil works project which exists or is under construction will be evaluated to insure that they are compatible with the purposes of the project.

(2) *Non-Federal dredging for navigation.* (i) The benefits which an authorized Federal navigation project is intended to produce will often require similar and related operations by non-Federal agencies (e.g., dredging an access channel to dock and berthing facilities or deepening such a channel to correspond to the Federal project depth). These non-Federal activities will be considered by Corps of Engineers officials in planning the construction and maintenance of Federal navigation projects and, to the maximum practical extent, will be coordinated with interested Federal, State, regional and local agencies and the general public simultaneously with the associated Federal projects. Non-federal activities which are not so coordinated will be individually evaluated in accordance with paragraph (f) of this section. In evaluating the public interest in connection with applications for permits for such coordinated operations, equal treatment will, therefore, be accorded to the fullest extent possible to both Federal and non-Federal operations. Furthermore, permits for non-Federal dredging operations will contain conditions requiring the permittee to comply with the same practices or requirements utilized in connection with related Federal dredging operations with respect to such matters as turbidity, water quality, containment of material, nature and location of approved spoil disposal areas (non-Federal use of Federal contained, disposal areas will be in accordance with laws authorizing such areas and regulations governing their use), extent and period of dredging, and other factors relating to protection of environmental and ecological values. (See also paragraph (g)(17) of this section.)

(ii) A permit for the dredging of a channel, slip, or other such project for navigation will also authorize the periodic maintenance dredging of the project. Authority for maintenance dredging will be subject to revalidation at regular intervals to be specified in the permit. Revalidation will be in accordance with the procedures prescribed in paragraph (n)(5) of this section. The permit, however, will require the permittee to give advance notice to the District Engineer each time maintenance dredging is to be performed.

(3) *Effect on wetlands.* (i) Wetlands are those land and water areas subject to regular inundation by tidal, riverine, or lacustrine flowage. Generally included are inland and coastal shallows, marshes, mudflats, estuaries, swamps, and similar areas in coastal and inland navigable waters. Many such areas serve important purposes relating to fish and wildlife, recreation, and other elements of the general public interest. As environmentally vital areas, they constitute a productive and valuable public resource, the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest.

(ii) Wetlands considered to perform functions important to the public interest include:

(*a*) Wetlands which serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic or land species;

(*b*) Wetlands set aside for study of the aquatic environment or as sanctuaries or refuges;

(*c*) Wetlands contiguous to areas listed in paragraph (g)(3)(ii) (*a*) and (*b*) of this section, the destruction or alteration of which would affect detrimentally the natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns, or other environmental characteristics of the above areas;

(*d*) Wetlands which are significant in shielding other areas from wave action, erosion, or storm damage. Such wetlands often include barrier beaches, islands, reefs and bars;

(*e*) Wetlands which serve as valuable storage areas for storm and flood waters; and

(*f*) Wetlands which are prime natural recharge areas. Prime recharge areas are locations where surface and ground water are directly interconnected.

(iii) Although a particular alteration of wetlands may constitute a minor change, the cumulative effect of numerous such piecemeal changes often results in a major impairment of the wetland resources. Thus, the particular wetland site for which an application is made will be evaluated with the recognition that it is part of a complete and interrelated wetland area. In addition, the District Engineer may undertake reviews of particular wetland areas, in response to new applications, and in consultation with the appropriate Regional Director of the Bureau of Sport Fisheries and Wildlife, the Regional Director of the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration, the Regional Administrator of the Environmental Protection Agency, the local representative of the Soil Conservation Service of the Department of Agriculture, and the head of the appropriate State agency to assess the cumulative effect of activities in such areas.

(iv) Unless the public interest requires otherwise, no permit shall be granted for work in wetlands identified as important by subparagraph (ii), above, unless the District Engineer concludes, on the basis of the analysis required in paragraph (f) of this section, that the benefits of the proposed alteration outweigh the damage to the wetlands resource and the proposed alteration is necessary to realize those benefits.

(*a*) In evaluating whether a particular alteration is necessary, the District Engineer shall primarily consider whether the proposed activity is dependent upon the wetland resources and environment and whether feasible alternative sites are available.

(*b*) The applicant must provide sufficient data on the basis of which the availability of feasible alternative sites can be evaluated.

(v) In accordance with the policy expressed in paragraph (f)(3) of this section, and with the Congressional policy expressed in the Estuary Protection Act, PL 90-454, state regulatory laws or programs for classification and protection of wetlands will be given great weight. (See also paragraph (g)(18) of this section).

(4) *Fish and wildlife.* (i) In accordance with the Fish and Wildlife Coordination Act (see paragraph (c)(5) of this section) Corps of Engineers officials will in all permit cases, consult with the Regional Director, U.S. Fish and Wildlife Service, the Regional Director, National Marine Fisheries Service, and the head of the agency responsible for fish and wildlife for the state in which the work is to be performed, with a view to the conservation of wildlife resources by prevention of their loss and damage due to the work or structures proposed in a permit application (see paragraphs (i)(1)(ii) and (j)(2) of this section). They will give great weight to these views on fish and wildlife considerations in evaluating the application. The applicant will be urged to modify his proposal to eliminate or mitigate any damage to such resources, and in appropriate cases the permit may be conditioned to accomplish this purpose.

(ii) The Division Engineer may issue a permit over an unresolved objection based on fish and wildlife considerations by the regional representative of Federal fish and wildlife agencies unless otherwise directed by the Chief of Engineers; provided, however, that the policies and procedures stated in the Memorandum of Understanding between the Department of the Army and the Department of the Interior (Appendix B) will be followed with respect to all activities involving dredging, excavation, filling and other related work.

(5) *Water quality.* (i) Applications for permits for activities which may affect the quality of navigable waters will be evaluated with a view toward compliance with applicable effluent limitations and water quality standards during both the construction and operation of the proposed activity. Certification of compliance with applicable effluent limitations and water quality standards required under provisions of Section 401 of the

Federal Water Pollution Control Act will be considered conclusive with respect to water quality considerations unless the Regional Administrator, Environmental Protection Agency (EPA), advises of other water quality aspects to be taken into consideration. If the certification provided is to the effect that no effluent limitation and water quality standards have been established as applicable to the proposed activity, or if certification is not required for the proposed activity, the advice of the Regional Administrator, EPA, on water quality aspects will be given great weight in evaluating the permit application. Any permit issued may be conditioned to implement water quality protection measures.

(ii) If the Regional Administrator, EPA, objects to the issuance of a permit on the basis of water quality considerations and the objection is not resolved by the applicant or the District Engineer, and the District Engineer would otherwise issue the permit, the application will be forwarded through channels to the Chief of Engineers for further coordination with the Administrator, EPA, and decision. (See also paragraphs (b)(7) and (b)(8), above, and (g)(17) and (i)(2)(i) of this section.)

(6) *Historic, scenic, and recreational values.* (i) Applications for permits covered by this regulation may involve areas which possess recognized historic, cultural, scenic, conservation, recreational or similar values. Full evaluation of the general public interest requires that due consideration be given to the effect which the proposed structure or activity may have on the enhancement, preservation, or development of such values. Recognition of those values is often reflected by State, regional, or local land use classifications (see paragraph (f)(3) of this section), or by similar Federal controls or policies. In both cases, action on permit applications should, insofar as possible, be consistent with, and avoid adverse effect on, the values or purposes for which those classifications, controls, or policies were established.

(ii) Specific application of the policy in paragraph (g)(6)(i) of this section, applies to:

(*a*) Rivers named in Section 3 of the Wild and Scenic Rivers Act (82 Stat. 906, 16 U.S.C. 1273 et seq.), and those proposed for inclusion as provided by sections 4 and 5 of the Act, or by later legislation.

(*b*) Historic, cultural, or archeological sites or practices as provided in the National Historic Preservation Act of 1966 (83 Stat. 852, 42 U.S.C. 4321 et seq.) (see also Executive Order 11593, May 13, 1971, and Statutes there cited). Particular attention should be directed toward any district, site, building, structure, or object listed in the National Register of Historic Places. Comments regarding such undertakings shall be sought and considered as provided by paragraph (i)(2)(iii) of this section.

(*c*) Sites included in the National Registry of Natural Landmarks which are published periodically in the FEDERAL REGISTER.

(*d*) Any other areas named in Acts of Congress or Presidential Proclamations as National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, National Monuments, and such areas as may be established under Federal law for similar and related purposes, such as estuarine and marine sanctuaries.

(7) *Structures for small boats.* As a matter of policy, in the absence of overriding public interest, favorable consideration will be generally be given to applications from riparian proprietors for permits for piers, boat docks, moorings, platforms and similar structures for small boats. Particular attention will be given to the location and general design of such structures to prevent possible obstructions to navigation with respect to both the public's use of the waterway and the neighboring proprietors' access to the waterway. Obstructions can result from both the existence of the structure, particularly in conjunction with other similar facilities in the immediate vicinity, and from its inability to withstand wave action or other forces which can be expected. District Engineers will inform applicants of the hazards involved and encourage safety in location, design and operation. Corps of Engineers officials will also encourage cooperative or group use facilities in lieu of individual proprietor use facilities.

(i) Letters transmitting permits for structures for small boats will, where applicable, include the following language: "Notice is hereby given that a possibility exists that the structure permitted may be subject to damage by wave wash from passing vessels. Your attention is invited to special condition ______ of the permit." The appropriate designation of the permit condition placing responsibility on the permittee and not on the United States for integrity of the structure and safety of boats moored thereto will be inserted.

(ii) Floating structures for small recreational boats or other recreational purposes in lakes owned and operated by the Corps of Engineers under a Resources Manager are normally subject to permit authorities cited in paragraph (b), above when those waters are regarded as navigable waters of the United States. (See 33 CFR 209.260). However, such structures will not be authorized under this regulation but will be regulated under applicable regulations of the Chief of Engineers published in Chapter III, Part 327.19 of Title 36, Code of Federal Regulations if the land surrounding those lakes is under complete Federal ownership. District Engineers will delineate those portions of the navigable waters of the United States where this provision is applicable and post notices of this designation in the vicinity of the lake Resources Manager's office.

(8) *Aids to navigation.* (i) The placing of non-Federal fixed and floating aids to navigation in a navigable water of the United States is within the purview of section 10 of the River and Harbor Act of 1899. Furthermore, these aids are of particular interest to the U.S. Coast Guard because of their control of marking, lighting and standardization of such navigation aids. Applications for permits for installation of aids to navigation will, therefore, be coordinated with the appropriate District Commander, U.S. Coast Guard, and permits for such aids will include a condition to the effect that the permittee will conform to the requirements of the Coast Guard for marking, lighting, etc. Since most fixed and floating aids to navigation will not ordinarily significantly affect environmental values, the usual form of authorization to be used will be a letter of permission.

(ii) Fishing structures and appliances in navigable waters of the United States will be lighted for the safety of navigation as follows: Lights will be displayed between sunset and sunrise. They will be placed at each end of the structure, except where the inner end terminates at such a point where there could be no practicable navigation between it and the high-water line of the adjacent coast. In such case no inner light will be required. The outer light will be white, and the inner light will be red. The size, capacity, and manner of maintenance of the lights will be specified in the Department of the Army permit authorizing the erection of the structure or appliances. When several structures or appliances are placed on one line with no navigable passage between them, they will be considered for lighting purposes as one structure.

(9) *Outer continental shelf.* Artificial islands and fixed structures located on the outer continental shelf are subject to the standard permit procedures of this regulation. Where the islands or structures are to be constructed on lands which are under mineral lease from the Bureau of Land Management, Department of the Interior, that agency, in cooperation with other Federal agencies, fully evaluates the potential effect of the leasing program on the total environment. Accordingly, the decision whether to issue a permit on lands which are under mineral lease from the Department of the Interior will be limited to an evaluation of the impact of the proposed work on navigation and national security. The public notice will so identify the criteria (see paragraph (j)(1)(viii) (*b*) of this section).

(10) *Effect on limits of the territorial sea.* Structures or work affecting coastal waters may modify the coast line or baseline from which the three mile belt is measured for purposes of the Submerged Lands Act and International Law. Generally, the coast line or base line is the line of ordinary low water on the mainland; however, there are exceptions where there are islands or low-tide elevations off shore. (See the Submerged Lands Act, 67 Stat. 29, U.S. Code section 1301(c), and United States v. California, 381 U.S. 139 (1965), 382 U.S. 448 (1966)). All applications for structures or work affecting coastal waters will therefore be reviewed specifically to determine whether the coast line or baseline might be altered. If it is determined that such a change might occur, coordination with

the Attorney General and the Solicitor of the Department of the Interior is required before final action is taken. The District Engineer will submit a description of the proposed work and a copy of the plans to the Solicitor, Department of the Interior, Washington, D.C. 20240, and request his comments concerning the effects of the proposed work on the outer continental rights of the United States. These comments will be included in the file of the application. After completion of standard processing procedures, the file will be forwarded to the Chief of Engineers. The decision in the application will be made by the Secretary of the Army after coordination with the Attorney General.

(11) *Canals and other artificial waterways connected to navigable waters.* (i) A canal or similar artificial waterway is subject to the regulatory authorities discussed in paragraph (b) (2) of this section if it constitutes a navigable water of the United States, or if it is connected to navigable waters of the United States in a manner which affects their course, condition, or capacity. In all cases the connection to navigable waters of the United States requires a permit. Where the canal itself constitutes a navigable water of the United States, evaluation of the permit application and further exercise of regulatory authority will be in accordance with the standard procedures of this regulation. For all other canals the exercise of regulatory authority is restricted to those activities which affect the course, condition, or capacity of the navigable waters of the United States. Examples of the latter may include the length and depth of the canal; the currents circulation, quality and turbidity of its waters, especially as they affect fish and wildlife values; and modifications or extensions of its configuration.

(ii) The proponent of canal work should submit his application for a permit, including a proposed plan of the entire development, and the location and description of anticipated docks, piers and other similar structures which will be placed in the canal, to the District Engineer before commencing any form of work. If the connection to navigable waters of the United States has already been made without a permit, the District Engineer will proceed in accordance with paragraph (g) (12) (i) of this section. Where a connection has not yet occurred, but canal construction is planned or has already begun, the District Engineer will, in writing, advise the proponent of the need for a permit to connect the canals to navigable waters of the United States. He will also ask the proponent if he intends to make such a connection and will request the immediate submission of the plans and permit application if it is so intended. The District Engineer will also advise the proponent that any work is done at the risk that, if a permit is required, it may not be issued, and that the existence of partially-completed excavation work will not be allowed to weigh favorably in evaluation of the permit application.

(12) *Unauthorized activities.* The following procedures will be followed with respect to activities which are performed without proper authorization.

(i) When the District Engineer becomes aware of any unauthorized activity which is still in progress, he shall immediately issue a cease and desist order to all persons responsible for and/or involved in the performance of the activity. In appropriate cases, the District Engineer may also order interim protective measures to be taken in order to protect the public interest. If there is noncompliance with this cease and desist order, the District Engineer shall forward a factual report immediately to the local U.S. Attorney with a request that a temporary restraining order and/or preliminary injunction be obtained against the responsible persons.

(ii) In all cases, the District Engineer shall commence an immediate investigation to ascertain the facts surrounding the unauthorized activity. In making this investigation, the District Engineer shall solicit the views of appropriate Federal, State and local agencies, and shall request the persons involved in the unauthorized activity to provide appropriate information on this activity which will assist him in evaluating the activity and recommending the course of action to be taken. The District Engineer shall evaluate the information and views developed during this investigation in conjunction with the factors and criteria cited in paragraph (f) of this section and shall formulate recommendations as to the appropriate administrative and/or legal action to be taken, subject to the following:

(*a*) Except where the activity was performed in nontidal waters prior to an administrative, judicial or legislative determination that the water is a navigable water of the United States, the District Engineer is not authorized to process or accept for processing any permit application received.

(*1*) The District Engineer shall in all cases other than those covered by paragraph (g) (12) (ii) (*a*) (*2*) of this section prepare and forward a report to the Chief of Engineers, ATTN: DAEN–GCK, which shall contain an analysis of the data and information obtained during this investigation and recommend appropriate civil and criminal action. In those cases where the analysis of the facts developed during his investigation, when made in conjunction with the factors and criteria in paragraph (f) of this section leads to the preliminary conclusion that removal of the unauthorized activity is in the public interest, the District Engineer shall also recommend restoration of the area to its original condition.

(*2*) In those cases to which the provisions of paragraph (m) (3), below, apply, the District Engineer may refer the matter directly to the local United States Attorney for appropriate legal action.

(*b*) If criminal and/or civil action is instituted against the responsible person, the District Engineer shall not accept for processing any application until final disposition of all judicial proceedings, including the payment of all prescribed penalties and fines and/or the completion of all work ordered by the court. Thereafter, the District Engineer may accept an application for a permit; Provided, that with respect to any judicial order requiring partial or total restoration of an area, the District Engineer, if so ordered by the court, shall supervise this restoration effort and may allow the responsible persons to apply for a permit for only that portion of the unauthorized activity for which restoration has not been so ordered.

(*c*) In those cases where the District Engineer determines that the unauthorized activity was performed in nontidal waters, prior to an administrative, judicial or legislative determination that the water is a navigable water of the United States, the District Engineer shall instruct the responsible persons to immediately file for a permit, unless he determines on the basis of all the facts and circumstances that immediate legal action is warranted. In such cases, the District Engineer will follow the procedures of paragraph (g) (12) (ii) (*a*) and (*b*) of this section.

(iii) Processing and evaluation of applications for after-the-fact authorizations for activities undertaken without the required Department of the Army authorizations will in all other respects follow the standard procedures of this regulation. Thus, authorizations may still be denied in accordance with the policies and procedures of this regulation.

(iv) Where after-the-fact authorization in accordance with this paragraph is determined to be in the public interest, the standard permit form for the activity will be used, omitting inappropriate conditions, and including whatever special conditions the District Engineer may deem appropriate to mitigate or prevent undesirable effects which have occurred or might occur.

(v) Where after-the-fact authorization is not determined to be in the public interest, the notification of the denial of the permit will prescribe any corrective actions to be taken in connection with the work already accomplished and establish a reasonable period of time for the applicant to complete such actions. The District Engineer, after denial of the permit, will again consider whether civil or criminal action is appropriate.

(vi) If the applicant declines to accept the proposed permit conditions, or fails to take corrective action prescribed in the notification of denial, or if the District Engineer determines, after denying the permit application, that legal action is appropriate, the matter will be referred to the Chief of Engineers, ATTN: DAEN-GCK, with recommendations for appropriate action.

(vii) Applications will generally not be required for work or structures completed before 18 December 1968, nor where potential applicants had received expressions of disclaimer prior to the date of this regulation; *provided, however,* That the procedures of paragraph

(g) (12) (i) of this section shall apply to all work or structures which were commenced or completed on or after 18 December 1968, and may be applied to all specific cases, regardless of date of construction or previous disclaimers, for which the District Engineer determines that the interests of navigation so require.

(13) *Facilities at the borders of the United States.* (i) The construction, operation, maintenance, or connection of facilities at the borders of the United States are subject to Executive control and must be authorized by the President, Secretary of State, or other delegated official.

(*a*) Applications for permits for the construction, operation, maintenance, or connection at the borders of the United States of facilities for the transmission of electric energy between the United States and a foreign country, or for the exportation or importation of natural gas to or from a foreign country, must be made to the Federal Power Commission. (See Executive Order 10485, September 3, 1953, 16 U.S.C. 824(a) (e), 15 U.S.C. 717b, and 18 CFR Parts 32 and 153).

(*b*) Applications for the landing or operation of submarine cables must be made to the Federal Communications Commission. (See Executive Order 10530, May 10, 1954, 47 U.S.C. 34 to 39, and 47 CFR 1.767).

(*c*) The Secretary of State is to receive applications for permits for the construction, connection, operation, or maintenance, at the borders of the United States, of: (*1*) pipelines, conveyors belts, and similar facilities for the exportation or importation of petroleum products, coals, minerals, or other products to or from a foreign country; (*2*) facilities for the exportation or importation of water or sewage to or from a foreign country; (*3*) monorails, aerial cable cars, aerial tramways and similar facilities for the transportation of persons or things, or both, to or from a foreign country. (See Executive Order 11423, August 16, 1968).

(ii) A Department of the Army permit under Section 10 of the River and Harbor Act of March 3, 1899 is also required for all of the above facilities which affect the navigable waters of the United States, but in each case in which a permit has been issued as provided above, the decision whether to issue the Department of the Army permit will be based primarily on factors of navigation, since the basic existence and operation of the facility will have been examined and permitted as provided by the Executive Orders. Furthermore, in those cases where the construction, maintenance, or operation at the above facilities involves the discharge of dredged or fill material in navigable waters or the transportation of dredged material for the purpose of dumping it into ocean waters, appropriate Department of the Army authorizations under section 404 of the Federal Water Pollution Control Act or under section 103 of the Marine Protection Research and Sanctuaries Act of 1972 are also required. Evaluation of applications for these authorizations will be in accordance with paragraph (g) (17) of this section.

(14) *Power transmission lines.* (i) Permits under section 10 of the River and Harbor Act of March 3, 1899, (33 U.S.C. 403) are required for power transmission lines crossing navigable waters of the United States unless those lines are part of a water power project subject to the regulatory authorities of the Federal Power Commission under the Federal Water Power Act of 1920 (16 U.S.C. 797). If an application is received for a permit for lines which are part of a water power project, the applicant will be instructed to submit his application to the Federal Power Commission. If the lines are not part of a water power project, the application will be processed in accordance with the procedures prescribed in this regulation.

(ii) The following minimum clearances are required for aerial electric power transmission lines crossing navigable waters of the United States. These clearances are related to the clearances over the navigable channel provided by existing fixed bridges, or the clearances which would be required by the U.S. Coast Guard for new fixed bridges, in the vicinity of the proposed power line crossing. The clearances are based on the low point of the line under conditions which produce the greatest sag, taking into consideration temperature, load, wind, length of span, and type of supports as outlined in the National Electrical Safety Code.

Nominal system voltage, kV:	*Minimum additional clearance (ft.) above clearance required for bridges*
115 and below	20
138	22
161	24
230	26
350	30
500	35
700	42
750–765	45

(15) *Seaplane operations.* Structures in navigable waters of the United States associated with seaplane operations require Department of the Army permits, but close coordination with the Federal Aviation Administration (FAA), Department of Transportation, is required on such applications.

(i) The FAA must be notified by an applicant whenever he proposes to establish or operate a seaplane base. The FAA will study the proposal and advise the applicant, District Engineer, and other interested parties as to the effects of the proposal on the use of airspace. The District Engineer will therefore refer any objections regarding the effect of the proposal on the use of airspace to the FAA, and give due consideration to their recommendations when evaluating the general public interest.

(ii) If the seaplane base will serve air carriers licensed by the Civil Aeronautics Board, the applicant must receive an airport operating certificate from the FAA. That certificate reflects determination and conditions relating to the installation, operation, and maintenance of adequate air navigation facilities and safety equipment. Accordingly, the District Engineer may, in evaluating the general public interest, consider such matters to have been primarily evaluated by the FAA.

(16) *Foreign Trade Zones.* The Foreign Trade Zones Act (48 Stat. 998–1003, 19 U.S.C. sections 81a to 81u, as amended) authorizes the establishment of foreign-trade zones in or adjacent to United States ports of entry under terms of a grant and regulations prescribed by the Foreign-Trade Zones Board. Pertinent regulations are published at Title 15 of the Code of Federal Regulations, Part 400. The Secretary of the Army is a member of the Board, and construction of a zone is under the supervision of the District Engineer. Laws governing the navigable waters of the United States remain applicable to foreign-trade zones, including the general requirements of this regulation. Evaluation by a District Engineer of a permit application may give recognition to the consideration by the Board of the general economic effects of the zone on local and foreign commerce, general location of wharves and facilities, and other factors pertinent to construction, operation, and maintenance of the zone.

(17) *Discharge of dredged or fill material in navigable waters or dumping of dredged material in ocean waters.* (i) Applications for permits for the discharge of dredged or fill material into navigable waters at specific disposal sites will be reviewed in accordance with guidelines promulgated by the Administrator, EPA, under authority of section 404(b) of the Federal Water Pollution Control Act. If the EPA guidelines alone prohibit the designation of a proposed disposal site, the economic impact on navigation and anchorage of the failure to authorize the use of the proposed disposal site in navigable waters will also be considered in evaluating whether or not the proposed discharge is in the public interest.

(ii) Applications for permits for the transporting of dredged material for the purpose of dumping it into ocean waters will be evaluated to determine that the proposed dumping will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. In making the evaluation, Corps of Engineers officials will apply criteria established by the Administrator, EPA, under authority of section 102 (a) of the Marine Protection, Research and Sanctuaries Act of 1972, and will specify the dumping sites, using the recommendations of the Administrator, pursuant to section 102(c) of the Act, to the extent feasible. (See 40 CFR Part 220). In evaluating the need for the dumping as required by paragraph (f) (2) (i) of this section, Corps of Engineers officials will consider the potential effect of a permit denial on navigation, economic and industrial development, and foreign and domestic commerce of the United States.

(iii) Sites previously designated for use as disposal sites for discharge or dumping of dredged material will be specified to the maximum practicable extent in permits for the discharge or dumping of dredged material in navigable waters or ocean waters unless restricted by the Administrator, EPA, in accordance with section 404(c) of the Federal Water Pollution Control Act or section 102(c) of the Marine Protection, Research, and Sanctuaries Act of 1972.

(iv) Prior to actual issuance of permits for the discharge or dumping of dredged or fill material in navigable or ocean waters, Corps of Engineers officials will advise appropriate Regional Administrators, EPA, of the intent to so issue permits. If the Regional Administrator advises, within fifteen days of the advice of the intent to issue, that he objects to the issuance of the permits, the case will be forwarded to the Chief of Engineers in accordance with paragraph (s), below, for further coordination with the Administrator, EPA, and decision. The report forwarding the case will contain an analysis for a determination by the Secretary of the Army that there is no economically feasible method or site available other than that to which the Regional Administrator objects. (See also paragraphs (b)(7) and (b)(8) of this section.)

(18) *Activities in coastal zones and marine sanctuaries.* (i) Applications for Department of the Army authorizations for activities in the coastal zones of those States having a coastal zone management program approved by the Secretary of Commerce will be evaluated with respect to compliance with that program. No permit will be issued until the applicant has certified that his proposed activity complies with the coastal zone management program and the appropriate State agency has concurred with the certification or has waived its right to do so (see paragraph (i)(2)(ii) of this section); however, a permit may be issued if the Secretary of Commerce, on his own initiative or upon appeal by the applicant, finds that the proposed activity is consistent with the objectives of the Coastal Zone Management Act of 1972 or is otherwise necessary in the interest of national security.

(ii) Applications for Department of the Army authorization for activities in a marine sanctuary established by the Secretary of Commerce under authority of section 302 of the Marine Protection, Research, and Sanctuaries Act of 1972 will be evaluated for impact on the marine sanctuary. No permit will be issued until the applicant provides a certification from the Secretary of Commerce that the proposed activity is consistent with the purposes of Title III of the Marine Protection, Research and Sanctuaries Act of 1972 and can be carried out within the regulations promulgated by the Secretary of Commerce to control activities within the marine sanctuary. Authorizations so issued will contain such special conditions as may be required by the Secretary of Commerce in connection with his certification.

(h) *Applications for authorizations.* (1) Any person proposing to undertake any activity requiring Department of the Army authorization as specified in paragraph (e) of this section, must apply for a permit to the District Engineer in charge of the District where the proposed activity is to be performed. Applications for permits must be prepared in accordance with instructions in the pamphlet entitled "Applications for Department of the Army Permits for Activities in Waterways" published by the Corps of Engineers, utilizing the prescribed application form (ENG Form 4345). The form and pamphlet may be obtained from the District Engineer having jurisdiction over the waterway in which the proposed activity will be located. Local variations of the application form for purposes of facilitating coordination with State and local agencies may be proposed by District or Division Engineers. These variations will be submitted for approval to DAEN–CWO–N and for clearance by the Office of Management and Budget.

(2) Generally, the application must include a complete description of the proposed activity, which includes necessary drawings, sketches or plans, the location, purpose and intended use of the proposed activity; scheduling of the activity; the names and addresses of adjoining property owners and the location and dimensions of adjacent structures; and the approvals required by other Federal, interstate, State or local agencies for the work, including all approvals or denials already made.

(i) If the activity involves dredging in navigable waters of the United States, the application must include a description of the type, composition and quantity of the material to be dredged, the method of dredging, and the site and plans for disposal of the dredged material.

(ii) If the activity includes the discharge of dredged or fill material in the navigable waters or the transportation of dredged material for the purpose of dumping it in the ocean waters, the application must include the source of the material, a description of the type, composition and quantity of the material, the method of transportaton and disposal of the material, and the location of the disposal site. Certification under section 401 of the Federal Water Pollution Control Act is required for such discharges into navigable waters. In addition, applicants for permits for these activities are required to pay a fee of $100 per application if the quantity of the material to be discharged in navigable waters or to be dumped in ocean waters exceeds 2500 cubic yards; if the quantity of material is 2500 cubic yards or less, the fee is $10 per application. Agencies or instrumentalities of Federal, State, or local governments will not be required to pay any fee in connection with applications for permits. This fee structure will be reviewed from time to time.

(iii) If the activity includes the construction of a fill or pile or float-supported platform, the project description must include specific structures to be erected on the fill or platform.

(iv) If the activity includes the construction of a structure the normal use of which may result in a discharge of pollutants, other than dredged or fill material, into navigable waters or ocean waters, the application must include either the identification of the application for the discharge permit assigned by the appropriate water pollution control agency or a copy of that application. Certification under Section 401 of the Federal Water Pollution Control Act is required for such discharges into navigable waters.

(v) If the activity will be located within a marine sanctuary established by the Secretary of Commerce, the application must include a copy of the certification from the Secretary of Commerce that the proposed activity is consistent with the purposes of Title III of the Marine Protection, Research and Sanctuaries Act of 1972 and can be carried out within the regulations promulgated by the Secretary of Commerce to control activities within the marine sanctuary.

(vi) If the activity requires the preparation of an environmental impact statement (see paragraphs (i)(1)(iv) and (1) of this section), which necessitates the development of data and information which will result in substantial expense to the United States, the District Engineer may, after obtaining written approval from the Division Engineer, charge the applicant for those extraordinary expenses incurred in the development of this information pursuant to 31 U.S.C. 483(a). All money so collected shall be paid into the Treasury of the United States as miscellaneous receipts. In lieu of this assessment, the District Engineer may require reports, data, and other information for the environmental impact statement (see paragraph (h)(3) of this section), to be compiled by an independent third party under contract with the applicant and furnished directly to the District Engineer; *Provided,* In such cases, the District Engineer shall specify the type of information to be developed; *And provided further,* That the information furnished by this third party contractor may not be used by the District Engineer to assist in his preparation of the environmental impact statement unless he has approved the selection of this third party contractor after consulting with interested Federal, State, and local agencies, public interest groups, and members of the general public, as he deems appropriate, to assure objectivity in this selection. In either case, the District Engineer should advise the applicant in writing that there is no assurance that favorable action will ultimately be taken on his application.

(3) In addition to that information indicated in paragraph (h)(2) of this section, the applicant will be required to furnish such additional information as the District Engineer may deem necessary to assist him in his evaluation of the application. Such additional information may include an environmental assessment, including information on alter-

nate methods and sites, as may be necessary for the preparation of an environmental impact statement (see paragraph (l), below).

(4) The application must be signed by the person who desires to undertake the proposed activity; however, the application may be signed by a duly authorized agent if accompanied by a statement by that person designating the agent and agreeing to furnish, upon request, supplemental information in support of the application. In either case, the signature of the applicant will be understood to be an affirmation that he possesses the authority to undertake the activity proposed in his application, except where the lands are under the control of the Corps of Engineers, in which case the District Engineer will coordinate the transfer of the real estate and the permit action. When the application is submitted by an agent, the application may include the activity of more than one owner provided the character of the activity of each owner is similar and in the same general area.

(i) *Processing applications for permits—(1) standard procedures.* (i) When an application for a permit is received, the District Engineer shall immediately assign it a number for identification, acknowledge receipt thereof, and advise the applicant of the number assigned to it. He shall review the application for completeness and obtain from the applicant any additional information he deems necessary for further processing.

(ii) When all required information has been provided, the District Engineer will issue a public notice as described in paragraph (j) of this section unless specifically exempted by other provisions of this regulation. The notice will be distributed for posting in post offices or other appropriate public places in the vicinity of the site of the proposed work and will be sent to the applicant, to appropriate city and county officials, to adjoining property owners, to appropriate State agencies, to concerned Federal agencies, to local, regional and national shipping and other concerned business and conservation organizations, and to any other interested parties. If in the judgment of the District Engineer the proposal may result in substantial public interest, the public notice (without drawings) may be published for five consecutive days in the local newspaper, and the applicant shall reimburse the District Engineer for the costs of publication. Copies of public notices will be sent to all parties who have specifically requested copies of public notices, to the U.S. Senators and Representatives for the area where the work is to be performed, the Field Representative of the Secretary of the Interior, the Regional Director of the Bureau of Sport Fisheries and Wildlife, the Regional Director of the National Park Service, the Regional Administrator of the Environmental Protection Agency (EPA), the Regional Director of the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NOAA), the head of the State agency responsible for fish and wildlife resources, the District Commander, U.S. Coast Guard, and the Office of the Chief of Engineers, Attention: DAEN-CWO-N.

(iii) The District Engineer shall consider all comments received in response to the public notice in his subsequent actions on the permit application. Receipt of the comments will be acknowledged and they will be made a part of the official file on the application. Comments received as form letters or petitions may be acknowledged as a group to the person or organization responsible for the form letter or petition. If comments relate to matters within the special expertise of another Federal agency, the District Engineer may seek the advice of that agency. The applicant must be given the opportunity to furnish the District Engineer his proposed resolution or rebuttal to all objections from Government agencies and other substantive adverse comments before final decision will be made on the application.

(iv) The District Engineer will consider whether or not an environmental impact statement is necessary (see paragraph (l) of this section) at the earliest time during the processing of an application involving an activity which is not already subject to an environmental impact statement. This will be done when he can make an assessment of the environmental impact of a proposed activity, which in some cases may be upon receipt of the application due to the magnitude of the proposed project or the nature of the area involved. This will be reconsidered as additional information is developed; however, at the earliest time that it appears an environmental impact statement may be required, the District Engineer will require the applicant to furnish additional information and an analysis of the environmental impacts of the proposed action. A preliminary determination as to whether an environmental impact statement will be prepared or a statement that an environmental impact statement has already been prepared on the overall activity by the Corps of Engineers or another Federal agency, will be announced in the Public Notice (see paragraph (j) of this section). If the District Engineer determines that an environmental impact statement will not be prepared for the proposed activity, a finding to that effect will immediately be placed in the permit file and, if the public notice has indicated an intent to prepare a statement, will be announced to the public. This finding shall be dated and signed and shall include a brief statement of the facts and reasons for the decision. If the District Engineer believes that granting the permit may be warranted but that the proposed activity would significantly affect the quality of the human environment, he will prepare an environmental impact statement in accordance with § 209.410. In such cases and if a public hearing is to be held (see subparagraph (v), below), the proposed final environmental impact statement must be completed prior to the hearing. If a public meeting is held, however, the draft environmental impact statement will be filed with the Council on Environmental Quality (CEQ) at least 15 days prior to the meeting.

(v) If the proposed activity includes the discharge of dredged or fill material into navigable waters or the transportation of dredged material for the purpose of dumping it in ocean waters and a person or persons having an interest which may be affected by the issuance of a permit requests a hearing, or if a second State objects to issuance of a permit on the basis of water quality and requests a hearing, or if otherwise required by law or directed by the Chief of Engineers, the District Engineer will arrange a public hearing in accordance with applicable Corps of Engineers regulations (§ 209.133). If no public hearing is to be held and the District Engineer determines that public interest warrants and additional information necessary to the proper evaluation of the application would probably be obtained thereby, the District Engineer will hold a public meeting (see paragraph (k) of this section).

(vi) After all above actions have been completed, the District Engineer will determine in accordance with the record and applicable regulations whether or not the permit should be issued. If a permit is warranted, he will determine the conditions and duration which should be incorporated into the permit (see paragraphs (m) and (n) of this section). In accordance with the authorities specified in paragraph (p) of this section the District Engineer will take final action or forward the application with all pertinent comments, records, and studies, including the final environmental impact statement if prepared, and a statement of findings to support his recommendation, through channels to the official authorized to make the final decision. The report forwarding the application for decision will be in the format prescribed in paragraph (s) of this section. Notice that the application has been forwarded to higher headquarters will be furnished the applicant. When the final decision is made, the statement of findings to support that decision will be placed in the permit file. If an environmental impact statement was filed with CEQ, a copy of the statement of findings will be submitted to DAEN-CWO-N for filing with CEQ. In those cases where an environmental impact statement has not been prepared but the application is forwarded for decision in the format prescribed in paragraph(s) of this section, the report will serve as the Statement of Findings.

(vii) If the final decision is to deny the permit, the applicant will be advised in writing of the reason for denial. If the final decision is to issue the permit, the issuing official will forward two copies of the draft permit to the applicant for signature accepting the conditions of the permit. The applicant will return both signed copies to the issuing officials who then signs and dates the permit. The permit is not valid until signed by the issuing official. Final action on the permit application is the signature on the letter

notifying the applicant of the denial of his application or signature of the issuing official on the authorizing document.

(viii) The District Engineer will publish monthly a list of permits issued or denied during the previous month. The list will identify each action by public notice number, name of applicant, and brief description of activity involved. This list will be distributed to all persons who received any of the public notices listed.

(ix) If the applicant fails to respond within six months to any request or inquiry of the District Engineer, the District Engineer may advise the applicant by registered letter that his application will be considered as having been withdrawn unless the applicant responds thereto within thirty days of the date of the letter.

(2) *Procedures for particular types of permit situations.* (i) Activities requiring water quality certification:

(*a*) If water quality certification for the proposed activity is necessary under the provisions of the Federal Water Pollution Control Act, the District Engineer shall so notify the applicant and obtain from him either the appropriate certification or a copy of his application for such certification. The District Engineer shall forward one copy of the permit application to the appropriate certifying agency and two copies to the Regional Administrator of the Environmental Protection Agency (EPA). The District Engineer may issue the public notice of the application jointly with the certifying agency if arrangements for such joint notices have been approved by the Division Engineer. When the cerification is received a copy of the certification will be forwarded to the Regional Administrator of EPA who shall determine if the proposed activity may affect the quality of the waters of any State or States other than the State in which the work is to be performed. If he needs supplemental information in order to make this determination, the Regional Administrator may request it from the District Engineer who shall obtain it from the applicant and forward it to the Regional Administrator. The Regional Administrator shall, within thirty days of receipt of the application, certification and supplemental information, notify the affected State, the District Engineer, and the applicant in the event such a second State may be affected. The second State then has sixty days to advise the District Engineer that it objects to the issuance of the permit on the basis of the effect on the quality of its waters and to request a hearing.

(*b*) No authorization will be granted until required certification has been obtained or has been waived. Waiver is deemed to occur if the certifying agency fails or refuses to act on a request for certification within a reasonable period of time after receipt of such request. The request for certification must be made in accordance with the regulations of the certifying agency. In determining whether or not a waiver period has commenced, the District Engineer will verify that the certifying agency has received a valid request for certification. Three months shall generally be considered to be a reasonable period of time. If, however, special circumstances identified by the District Engineer require that action on an application be taken within a more limited period of time, the District Engineer shall determine a reasonable lesser period of time, advise the certifying agency of the need for action by a particular date and that, if certification is not received by that date, it will be considered that the requirement for certification has been waived. Similarly if it appears that circumstances may reasonably require a period of time longer than three months, the District Engineer may afford the certifying agency up to one year to provide the required certification before determining that a waiver has occurred. District Engineers shall check with the cetifying agency at the end of the allotted period of time before determining that a waiver has occurred.

(ii) If the proposed activity will be located in the coastal zone of a State, the District Engineer shall obtain from the applicant a certification that the activity conforms to the coastal zone management program of the State. Upon receipt of the certification, the District Engineer will forward a copy of the permit application and certification to the State agency responsible for implementing the coastal zone management program and request its concurrence or objection. The District Engineer can issue the public notice of the application jointly with the State agency if arrangements for such joint notices have been approved by the Division Engineer. A copy of the certification will also be sent, along with the public notice of the application to the Director, Office of Coastal Zone Management, NOAA, Department of Commerce, Rockville, Maryland 20852. If the State agency fails to concur or object to the certification within six months of receipt of the request, it will be presumed to waive its right to so act and the certification will be presumed to be valid. Before determining that a waiver has occurred, the District Engineer will check with the State agency to verify that it has failed to act. If the State agency objects to the proposed activity, the District Engineer will so advise the Director, Office of Coastal Zone Management, NOAA, and request advice within thirty days whether or not the Secretary of Commerce will review the objection. If the objection will not be reviewed, the permit will be denied. If, however, the Secretary of Commerce indicates he will review the objection, further action on the application will be held in abeyance pending notification of the results of the review. If the objection is sustained, the permit will be denied. If the objection is overruled by the Secretary's finding, however, the processing will be continued.

(iii) If the proposed activity involves any property listed in the National Register of Historic Places (which is published in its entirety in the FEDERAL REGISTER annually in February with addenda published each month), the District Engineer will determine if any aspect of the activity causes or may cause any change in the quality of the historical, architectural, archeological, or cultural character that qualified the property for listing in the National Register. Generally adverse effects occur under conditions which include but are not limited to destruction or alteration of all or part of the property; isolation from or alteration of its surrounding environment; and introduction of visual, audible, or atmospheric elements that are out of character with the property and its setting. If the District Engineer determines that the activity will have no effect on the property, he will proceed with the standard procedures for processing the application. If, however, the District Engineer determines that the activity will have an effect on the property, he will proceed in accordance with the procedures specified in the FEDERAL REGISTER, Volume 37, Number 220, November 14, 1972, pages 24146 to 24148.

(iv) If the proposed activity consists of the dredging of an access channel and/or berthing facility associated with an authorized Federal navigation project, the activity will be included in the planning and coordination of the construction or maintenance of the Federal project to the maximum extent feasible. Separate notice, meeting or hearing, and environmental impact statement will not be required for activities so included and coordinated; and the public notice issued by the District Engineer for these Federal and associated non-Federal activities will be the notice of intent to issue permits for those included non-Federal dredging activities required by paragraph (g)(17)(iv) of this section. The decision whether to issue or deny such a permit will be consistent with the decision on the Federal project unless special considerations applicable to the proposed activity are identified.

(v) In addition to the general distribution of public notices cited in paragraph (i)(1)(iv) of this section, notices will be sent to other addressees in appropriate cases as follows:

(*a*) If the activity involves structures or dredging along the shores of the sea or Great Lakes, to the Coastal Engineering Research Center, Washington, D.C. 20016.

(*b*) If the activity involves construction of fixed structures or artificial islands on the outer continental shelf or in the territorial seas, to the Deputy Assistant Secretary of Defense (Installations and Housing) Washington, D.C. 20310, the Director, Defense Mapping Agency, Hydrographic Center, Washington, D.C. 20390, Attention, Code N512, and the Director, National Ocean Survey, NOAA, Department of Commerce, Rockville, Maryland 20852.

(*c*) If the activity involves the construction of structures to enhance fish propagation along the Atlantic and Gulf coasts, to the Atlantic Estuarine Fisheries Center, National Marine Fisheries Service, NOAA, Department of Commerce, Beaufort, North Carolina 28416.

(*d*) If the activity involves the construction of structures which may affect

aircraft operations or for purposes associated with seaplane operations, to the Regional Director of the Federal Aviation Administration.

(e) If the activity is in connection with a foreign-trade zone, to the Executive Secretary, Foreign-Trade Zones Board, Department of Commerce, Washington, D.C. 20230, and to the appropriate District Director of Customs as Resident Representative, Foreign-Trade Zones Board.

(vi) Copies of permits will be furnished to other agencies in appropriate cases as follows:

(a) If the activity involves the construction of structures or artificial islands on the outer continental shelf, to the Director, Defense Mapping Agency, Hydrographic Center, Washington, D.C. 20390. Attention, Code N512 and to the Director, National Ocean Survey, NOAA, Department of Commerce, Rockville, Maryland 20852.

(b) If the activity involves the construction of structures to enhance fish propagation (fish havens) along the coasts of the United States, to Defense Mapping Agency, Hydrographic Center and National Ocean Survey as in paragraph (i)(2)(vi)(a) of this section and to the Atlantic Estuarine Fisheries Center, National Marine Fisheries Service, NOAA, Department of Commerce, Beaufort, North Carolina 28416.

(c) If the activity involves the erection of an aerial transmission line across a navigable water of the United States, to the Director, National Ocean Survey, NOAA, Department of Commerce, Rockville, Maryland 20852, reference C322.

(d) If the activity is listed in paragraph (i)(2)(vi) (a), (b), or (c) of this section or involves the transportation of dredged material for the purpose of dumping it in ocean waters, to the appropriate District Commander, U.S. Coast Guard.

(vii) If the District Engineer determines that a letter or permission (see paragraph (m) of this section) is the appropriate form of authorization to be issued, he may omit the publishing of a public notice; however, he will coordinate the proposal with all concerned fish and wildlife agencies, Federal and State, as required by the Fish and Wildlife Coordination Act. A copy of the letter of permission will be sent to the Regional Director, Bureau of Sport Fisheries and Wildlife.

(viii) If the circumstances surrounding a permit application require emergency action and the District Engineer considers that the public interest requires that the standard procedures must be abbreviated in the particular case, he will explain the circumstances and recommend special procedures to the Chief of Engineers, ATTN: DAEN-CWO-N by teletype. The Chief of Engineers, upon consultation with the Secretary of the Army or his authorized representative and other affected agencies, will instruct the District Engineer as to further processing of the application.

(ix) *General Permits.* The District Engineer may, after compliance with the other procedures of this regulation, issue general permits for certain clearly described categories of structures or work, including discharges of dredged or fill material, requiring Department of the Army permits. After a general permit has been issued, individual activities falling within those categories that are authorized by such general permits do not have to be further authorized by the procedures of this regulation unless the District Engineer determines, on a case-by-case basis, that the public interest requires.

(a) District Engineers will include only those activities that are substantially similar in nature, that cause only minimal adverse environmental impact when performed separately, and that will have only a minimal adverse cumulative effect on the environment as categories which are candidates for general permits.

(b) In addition to the conditions prescribed in Appendix C of this Regulation, any general permit issued by the District Engineer shall prescribe the following conditions:

(1) The maximum quantity of material that is authorized for discharge by the general permit in a single or incidental operation (if applicable);

(2) A description of the category or categories of activites included in the general permit; and

(3) The type of water(s) into which the activity may occur.

(c) The District Engineer shall require reporting procedures where the general permit fails to designate a specific water body or water bodies. He may require such procedures in other situations.

(d) A general permit may be revoked if it is determined that the cumulative effects of the activities by it will have an adverse impact on the public interest provided the procedures of paragraph (o) of this regulation are followed. Following revocation, any future activities in areas covered by the general permit shall be processed as individual permits under this regulation.

(3) *Timing of processing of applications.* In view of the extensive coordination with other agencies and the public and the study of all aspects of proposed activities required by the above procedures, applicants must allow adequate time for the processing of their applications. The District Engineer will be guided by the following time limits for the indicated steps in processing permit applications:

(i) Public notice should be issued within fifteen days of receipt of all required information from the applicant, unless joint notice with State agencies is to be used.

(ii) The receipt of comments as a result of the public notice should not extend beyond seventy-five days from the date of the notice.

(iii) The record of a public meeting should be closed not later than fifteen days after the meeting.

(iv) The District Engineer should either send notice of denial to the applicant, or issue the draft permit to the applicant for acceptance and signature, or forward the application to higher headquarters within thirty days of one of the following whichever is latest: receipt of notice of withdrawal of objections; completion of coordination following receipt of applicant's rebuttal of objections; receipt of the record of a public hearing; closing of the record of a public meeting; or expiration of the waiting period following the filing of the final environmental impact statement with CEQ.

(j) *Public notice and coordination with interested parties.* (1) The Public Notice is the primary method of advising all interested parties of the proposed activity for which a permit is sought and of soliciting comments and information necessary to evaluate the probable impact on the public interest. The notice must, therefore, include sufficient information to give a clear understanding of the nature of the activity to generate meaningful comments. The notice should include the following items of information:

(i) The name and address of the applicant;

(ii) The location of the proposed activity;

(iii) A brief description of the proposed activity, its purpose and intended use, including a description of the type of structures, if any, to be erected on fills, or pile or float-supported platforms, and a description of the type, composition and quantity of materials to be discharged or dumped and means of conveyance;

(iv) A plan and elevation drawing showing the general and specific site location and character of all proposed activities, including the size relationship of the proposed structures to the size of the impacted waterway and depth of water in the area;

(v) A list of other government authorizations obtained or requested, including required certifications relative to water quality, coastal zone management, or marine sanctuaries;

(vi) A statement concerning a preliminary determination of the need for and/or availability of an environmental impact statement;

(vii) Any other available information which may assist interested parties in evaluating the likely impact of the proposed activity, if any, on factors affecting the public interest, including environmental values;

(viii) A reasonable period of time, normally thirty days but not less than fifteen days from date of mailing, within which interested parties may express their views concerning the permit application; and

(ix) A paragraph describing the various factors on which decisions are based during evaluation of a permit application.

(a) Except as provided in paragraph (j)(1)(ix)(b) of this section the following will be included:

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the

public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, aesthetic, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use classification, navigation, recreation, water supply, water quality and, in general, the needs and welfare of the people. No permit will be granted unless its issuance is found to be in the public interest.

(*1*) If a Federal agency other than the Corps of Engineers has primary responsibility for licensing an activity and for environmental review as contemplated by the provisions of the National Environmental Policy Act, (see paragraph (*e*)(*3*) *of this section*), the public notice shall, in lieu of the general paragraph above, describe the actions and reviews pending before those agencies, recite the fact that District Engineers will consult with, and give due consideration to the findings of, those agencies and provide the following paragraph: "The decision whether to issue a permit will based on a consideration of the effect which the proposed activity will have on the navigable capacity of the waterway." (See particularly paragraphs (g)(13), (g)(15), and (g)(16) of this section.)

(2) If the activity involves the discharge of dredged or fill material into the navigable waters or the transportation of dredged material for the purpose of dumping it in ocean waters, the public notice shall also indicate that the evaluation of the impact of the activity on the public interest will include application of the guidelines promulgated by the Administrator, EPA, under authority of section 404(b) of the Federal Water Pollution Control Act or of the criteria established under authority of section 102(a) of the Marine Protection, Research and Sanctuaries Act of 1972 as appropriate.

(*b*) In cases involving construction of fixed structures or artificial islands on outer continental shelf lands which are under mineral lease from the Department of the Interior, the notice will contain the following statement: "The decision as to whether a permit will be issued will be based on an evaluation of the impact of the proposed work on navigation and *national security*."

(x) If the activity includes the discharge of dredged or *fill material* in the navigable waters or the transportation of dredged material for the purpose of dumping it in ocean waters, the following statement will also be included in the public notice:

Any person who has an interest which may be adversely affected by the issuance of a permit may request a public hearing. The request must be submitted in writing to the District Engineer within thirty days *of the date of this notice and must clearly* set forth the interest which may be adversely affected and the manner in which the interest may be adversely affected by the activity.

(2) It is presumed that all interested parties and agencies will wish to respond to public notices; therefore, a lack of response will be interpreted as meaning that there is no objection to the application. A copy of the public notice with the list of the addresses to whom the notice was sent will be included in the record. *If a question develops with respect to an activity for which another* agency has responsibility and that other agency has not responded to the public notice, the District Engineer may request their comments. Whenever a response to a public notice has been received from a member of Congress, either in behalf of a constituent or himself, the District Engineer will inform the member of Congress of the final decision.

(3) Notices sent to several agencies within the same State may result in conflicting comments from those agencies. While many States have designated a single State agency or individual to provide *a single and coordinated State position* regarding pending permit applications, where a State has not so designated a single source, District Engineers will elicit from the Governor an expression of his views and desires concerning the application. Where coordination is required by the Fish and Wildlife Coordination Act (see paragraph (c)(5) of this section), District Engineers will address a letter to the designated single Sate agency or Governor, as appropriate, inviting attention to the coordination requirements of the Fish and Wildlife Coordination Act and requesting that a report from the head *of the State agency responsible for fish* and wildlife resources be appended to the coordinated State report.

(k) *Public meetings*. (1) It is the policy of the Corps of Engineers to conduct the civil works program in an atmosphere of public understanding, trust, mutual cooperation, and in a manner responsive to the public interest. The views of all concerned persons are initially sought by means of public notices in connection with applications for permits. Where response to a notice indicates further opportunity for public expressions of interest may be warranted, and a public hearing is not required by law or directed by the Chief of Engineers, the District Engineer may hold a public meeting.

(2) A public meeting is a forum at which all concerned persons are given an opportunity to present additional information relevant to a proper evaluation of an application for a permit for an activity. If a public meeting is held, notice announcing the meeting will be published at least thirty days in advance of *the meeting. A summary of environ*mental considerations will be included in the notice. The applicant will be given an opportunity to present his proposal and explain why he thinks it is in the public interest. Officials of other Federal agencies or of State and local governments will be given opportunity to express their views, as well all other persons. The conduct of the meeting will be in accordance with § 209.405 and a transcript of the meeting will be part of the record.

(l) *Environmental impact statement*. (1) Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA) requires all Federal agencies, with respect to major Federal actions significantly *affecting the quality of the human* environment, to submit to CEQ a detailed statement on:

(i) The environmental impact of the proposed action;

(ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented;

(iii) Alternatives to the proposed action;

(iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity;

(v) Any irreversible and irretrievable commitments of resources which would be *involved in the proposed action* should it be implemented.

(2) As indicated in paragraph (l)(1)(iv) of this section the District Engineer must determine whether an environmental impact statement is required in connection with a permit application. If the District Engineer believes that granting the permit may be warranted but that the proposed activity would have a significant environmental impact, an environmental impact statement will be prepared, coordinated and filed in accordance with provisions of § 209.410 prior to final action on the application. If another agency is the lead agency as defined by section 5b of the CEQ guidelines contained in § 209.410, the District Engineer will coordinate with that agency to insure that the resulting environmental impact statement adequately describes the impact of the activity which is subject to Corps permit authority.

(3) The scope of the considerations to be discussed in an environmental impact statement depends heavily on continuing court interpretation of NEPA and on the nature of the activity for which authorization is requested.

(i) All the direct effects of the activity must be evaluated, as must any indirect effects which have a clear or proximate relationship to the activity. Other effects, however, may be too speculative or remote to merit detailed consideration. Thus an environmental impact statement which examines the probable environmental impact of an activity should evaluate all known effects which have a direct or proximate but indirect relationship to the proposal and should cite other remote or speculative effects.

(ii) *The scope of the environmental* impact statement is often somewhat different from that of the laws under which the activity may be authorized. Thus, an authorization may be only for a part of a much larger and more complex operation or development over which few regulatory controls exist. In such cases, the range of factors to be discussed in the environmental impact statement may

of necessity be expanded to include factors which are beyond the normal scope of the law on which the authorization depends.

(m) *Forms of authorization.* (1) The basic form for authorizing activities in navigable waters or ocean waters is ENG Form 1721, Department of the Army Permit (Appendix C). This form will be used to authorize activities under provisions of:

(i) Section 10 of the River and Harbor Act of March 3, 1899, in all cases where a letter of permission is not appropriate (see paragraph m(3) of this section.)

(ii) Section 404 of the Federal Water Pollution Control Act.

(iii) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1973.

(2) While the general conditions included in ENG Form 1721 are normally applicable to all permits, some may not apply to certain authorizations (e.g. after-the-fact situations where work is completed, or situations in which the permittee is a Federal agency) and may be deleted by the issuing officer. Special conditions applicable to the specific activity will be included in the permit as necessary to protect the public interest in the navigable waters or ocean waters.

(3) In those cases subject to section 10 of the River and Harbor Act of March 3, 1899, in which, in the opinion of the District Engineer, the proposed work is minor, will not have significant impact on environmental values, and should encounter no opposition, the District Engineer may use the abbreviated processing procedures of paragraph (i)(2)(vii) of this section and authorize the work by a letter of permission. The letter of permission will not be used to authorize the discharge of dredged or fill material into navigable waters or the transportation of dredged material for purpose of dumping it in ocean waters. The letter of permission will be in letter form and will identify the permittee, the authorized work and location of the work, the statutory authority (i.e., 33 U.S.C. 403), any limitations on the work, a construction time limit and a requirement for a report of completed work. A copy of the general conditions from ENG form 1721 will be attached and will be incorporated by reference into the letter of permission.

(4) Permits for structures under section 9 of the Act of March 3, 1899, will be drafted during review procedures at Department of the Army level.

(n) *Duration of authorizations.* (1) Authorizations for activities in or affecting navigable waters or ocean waters may authorize both the work and the resulting structure. Authorizations continue in effect until they automatically expire, or are modified, suspended, or revoked.

(2) Authorization for the existence of a structure or other form of alteration of the waterway is usually for an indefinite duration with no expiration date cited. However, where a temporary structure is authorized, or where restoration of a waterway is contemplated, the authorzation will be of limited duration with a definite expiration date. Except as provided in paragraph (r)(5) of this section permits for the discharge of dredged material in the navigable waters or for the transportation of dredged material for the purpose of dumping it in ocean waters will be of limited duration with a definite expiration date.

(3) Authorizations for construction work or other activity will specify time limits for accomplishing the work or activity. The time limits will specify a date by which the work must be started, normally one year from the date of issuance, and a date by which the work must be completed. The dates will be established by the issuing official and will provide reasonable times based on the scope and nature of the work involved. An authorization for work or other activity will automatically expire if the permittee fails to request an extension or revalidation.

(4) Extensions of time may be granted by the District Engineer for authorizations of limited duration, or for the time limitations imposed for starting or completing the work or activity. The permittee must request the extension and explain the basis of the request, which will be granted only if the District Engineer determines that an extension is in the general public interest. Requests for extensions will be procesed in acordance with the regular procedures of paragraph (i) of this section including issuance of a public notice, except that such processing is not required where the District Engineer determines that there have been no significant changes in the attendant circumstances since the authorization was issued and that the work is proceeding essentially in accordance with the approved plans and conditions.

(5) If the authorized work includes periodic maintenance dredging (see paragraph (g)(2) of this section), an expiration date for the authorization of that maintenance dredging will be included in the permit. The expiration date, which in no event is to exceed ten years from the date of issuance of the permit, will be established by the issuing official after his evaluation of the proposed method of dredging and disposal of the dredged material. If the permittee desires to continue maintenance dredging beyond the expiration date, he must request a revalidation of that portion of his permit which authorized the maintenance dredging. The request must be made to the District Engineer six months prior to the expiration date, and include full description of the proposed methods of dredging and disposal of dredged materials. The District Engineer will process the request for revalidation in accordance with the standard procedures in paragraph (h) of this section including the issuance of a public notice describing the authorized work to be maintained and the proposed methods of maintenance.

(o) *Modification, suspension or revocation of authorizations.* (1) The District Engineer may evaluate the circumstance and conditions of a permit either on his own motion or as the result of periodic progress inspections, and initiate action to modify, suspend, or revoke a permit as may be made necessary by considerations of the general public interest. Among the factors to be considered are the extent of the permittee's compliance with the terms and conditions of the permit; whether or not circumstances relating to the activity authorized have changed since the permit was issued, extended or revalidated, and the continuing adequacy of the permit conditions; any significant objections to the activity authorized by the permit which were not earlier considered; and the extent to which modification, suspension, or other action would adversely affect plans, investments and actions the permittee has reasonably made or taken in reliance on the permit. Significant increases in scope of a permitted activity will be processed as new applications for permits in accordance with paragraph (i) of this section, and not as modifications under this paragraph.

(2) The District Engineer, as a result of revaluation of the circumstances and conditions of a permit, may determine that protection of the general public interest requires a modification of the terms or conditions of the permit. In such cases, the District Engineer will hold informal consultations with the permittee to ascertain whether the terms and conditions can be modified by mutual agreement. If a mutual agreement is reached on modification of the terms and conditions of the permit, the District Engineer will give the permittee written notice of the modification, which will then become effective on such date as the District Engineer may establish, which in no event shall be less than ten days from its date of issuance. In the event a mutual agreement cannot be reached by the District Engineer and the permittee, the District Engineer will proceed in accordance with paragraph (o)(3) of this section if immediate suspension is warranted. In cases where immediate suspension is not warranted but the District Engineer determines that the permit should be modified, he will notify the permittee of the proposed modification and reasons therefor, and that he may request a hearing. The modification will become effective on the date set by the District Engineer which shall be at least ten days after receipt of the notice unless a hearing is requested within that period in accordance with § 209.133. If the permittee fails or refuses to comply with the modification the District Engineer will immediately refer the case for enforcement to DAEN-GCK.

(3) The District Engineer may, after telephonic consultation with the Division Engineer, suspend a permit after preparing a written determination and finding that immediate suspension would be in the general public interest. The District Engineer will notify the permittee in writing by the most expeditious means available that the permit has been suspended with the reasons therefor, and order the permittee to stop all previously authorized activities. The permittee will also be advised that following this suspension a decision will be made to either reinstate, modify, or revoke the permit,

and that he may request a hearing within 10 days of receipt of notice of the suspension to present information in this matter. If a hearing is requested the procedures prescribed in § 209.133 will be followed. After the completion of the hearing (or within a reasonable period of time after issuance of the notice to the permittee that the permit has been suspended if no hearing is requested) the District Engineer will take action to reinstate the permit, modify the permit, or recommend revocation of the permit in accordance with paragraph (o)(4) of this section.

(4) Following completion of the suspension procedures in paragraph (o)(3) of this section, if revocation of the permit is recommended, the District Engineer will prepare a report of the circumstances and forward it together with the record of the suspension proceedings to DAEN-CWO-N. The Chief of Engineers may, prior to deciding whether or not to revoke the permit, afford the permittee the opportunity to present any additional information not made available to the District Engineer at the time he made the recommendation to revoke the permit including, where appropriate, the means by which he intends to comply with the terms and conditions of the permit. The permittee will be advised in writing of the final decision.

(p) *Authority to issue or deny authorizations.* Except as otherwise provided in this regulation, the Secretary of the Army subject to such conditions as he or his authorized representative may from time to time impose, has authorized the Chief of Engineers and his authorized representatives to issue or deny authorizations for construction or other work in or affecting navigable waters of the United States pursuant to sections 10 and 14 of the Act of March 3, 1899, and section 1 of the Act of June 13, 1902. He also has authorized the Chief of Engineers and his authorized representatives to issue or deny authorizations for the discharge of dredged or fill material in the navigable waters pursuant to section 404 of the Federal Water Pollution Control Act or for the transportation of dredged material for the purpose of dumping it into ocean waters pursuant to section 103 of Marine Protection, Research and Sanctuaries Act of 1972. The authority to issue or deny permits pursuant to section 9 of the River and Harbor Act of March 3, 1899 has not been delegated to the Chief of Engineers or his authorized representatives.

(1) District Engineers are authorized to issue in accordance with this regulation permits and letters of permission which are subject to such special conditions as are necessary to protect the public interest in the navigable waters or ocean waters pursuant to sections 10 and 14 of the River and Harbor Act of March 3, 1899, section 1 of the River and Harbor Act of June 13, 1902, section 404 of the Federal Water Pollution Control Act, and section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, in all cases in which there are no known substantive objections to the proposed work or activity or in which objections have been resolved to the satisfaction of the District Engineer. It is essential to the legality of a permit that it contain the name of the District Engineer as the issuing officer. However, the permit need not be signed by the District Engineer, in person; but may be signed for and in behalf of him by whomever he designates. District Engineers are authorized to deny permits when required State or local authorization and/or certification has been denied (see paragraph (f)(3)(i) of this section), when a State has objected to a required certification of compliance with its coastal zone management program and the Secretary of Commerce has not reviewed the action and reached a contrary finding (see paragraph (g)(18) and (i)(2)(ii) of this section) or when the proposed work will unduly interfere with navigation. All other permit applications including those cases in paragraph (p)(2)(i) through (vii) of this section will be referred to Division Engineers. District Engineers are also authorized to add, modify, or delete special conditions in permits, except for those conditions which have been imposed by higher authority, and to suspend permits according to the procedures of paragraph (o)(3) of this section.

(2) Division Engineers will review, attempt to resolve outstanding matters, and evaluate all permit applications referred by District Engineers. Division Engineers may authorize the issuance or denial of permits pursuant to sections 10 and 14 of the River and Harbor Act of March 3, 1899, section 1 of the River and Harbor Act of June 13, 1902, section 404 of the Federal Water Pollution Control Act, and section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 and the inclusion of conditions to those permits as may be necessary to protect the public interest in the navigable waters or ocean waters in accordance with the policies cited in this regulation.

(i) Except as provided in paragraph (p)(2)(ii) of this section if the Division Engineer determines that issuance of a permit with or without conditions is in the public interest, but there is continuing objection to the issuance of the permit by another Federal agency, he shall advise the regional representative of that Federal agency of his intent to issue the permit. The Division Engineer shall not proceed with the issuance of a permit if, within 15 days after the date of this notice of intent to issue a permit, an authorized representative of that Federal Agency indicates to the Division Engineer in writing that he wishes to bring his concerns to Departmental level. In such cases, the proposed permit may be issued at the expiration of 30 days from the date of receipt of the letter from such representative unless, prior to that time, as a result of consultations at Departmental level, it is directed that the matter be forwarded to higher authority for resolution. Thereafter, a permit will be issued only pursuant to and in accordance with instructions from such higher authority. Every effort should be made to resolve differences at the Division Engineer level before referring the matter to higher authority.

(ii) Division Engineers will refer to the Chief of Engineers the following cases:

(*a*) When it is proposed to issue a permit and there are unresolved objections from another Federal agency which must be handled under special procedures specified in statutes or Memoranda of Understanding which thereby preclude final resolution by the Division Engineer (see paragraphs (g)(4), (5) and (17) of this section);

(*b*) When the recommended decision is contrary to the stated position of the Governor of the affected State or of a member of Congress;

(*c*) When there is substantial doubt as to authority, law, regulations, or policies applicable to the proposed activity;

(*d*) When higher authority requests the case be forwarded for decision;

(*e*) Where the case is recognized to be highly controversial, or litigation is anticipated;

(*f*) When the proposed activity would affect the baseline used for determination of the limits of the territorial sea.

Division Engineers may also authorize the modification or suspension of permits in accordance with the procedures of this regulation, and may recommend revocation of permits to the Chief of Engineers.

(q) *Supervision and enforcement.* (1) District Engineers will supervise all authorized activities and will require that the activity be conducted and executed in conformance with the approved plans and other conditions of the permit. Inspections must be made on timely occasions during performance of the activity and appropriate notices and instructions will be given permittees to insure that they do not depart from the approved plans. Revaluation of permits to assure complaince with its purposes and conditions will be carried out as provided in paragraph (o) of this section. If there are approved material departures from the authorized plans, the District Engineer will require the permittee to furnish corrected plans showing the activity as actually performed.

(2) Where the District Engineer determines that there has been noncompliance with the terms or conditions of a permit, he should first contact the permittee and attempt to resolve the problem. If a mutually agreeable resolution cannot be reached, a written demand for compliance will be made. If the permittee has not agreed to comply within 5 days of receipt of the demand, the District Engineer will issue an immediately effective notice of suspension in accordance with paragraph (o)(3) of this section above, and consider initiation of appropriate legal action.

(3) For purposes of supervision of permitted activities and for surveillance of the navigable waters for enforcement of the permit authorities cited in paragraph (b) of this section, the District Engineer will use all means at his disposal. One method of surveillance for unauthorized activities which should be used where

appropriate is aerial photographic reconnaissance. In addition, all Corps of Engineers employees will be instructed to observe and report all activities in navigable waters which would require permits. The assistance of members of the public and personnel of other interested Federal, State and local agencies to observe and report such activities will be encouraged. To facilitate this surveillance, the District Engineer will require a copy of ENG Form 4336 to be posted conspicuously at the site of all authorized activities and will make available to all interested persons information on the scope of authorized activities and the conditions prescribed in the authorizations. Furthermore, significant actions taken under paragraph (o), above, will be brought to the attention of those Federal, State and local agencies and other persons who express particular interest in the affected activity. Surveillance in ocean waters will be accomplished primarily by the Coast Guard pursuant to section 107(c) of the Marine Protection, Research and Sanctuaries Act of 1973. Enforcement actions relative to the permit authorities cited in paragraph (b) of this section, including enforcement actions resulting from noncompliance with permit conditions, will be in accordance with regulations published at § 209.170 (ER 1145-2-301).

(4) The expenses incurred in connection with the inspection of permitted activity in navigable waters normally will be paid by the Federal Government in accordance with the provisions of Section 6 of the River and Harbor Act of 3 March 1905 (33 U.S.C. 417) unless daily supervision or other unusual expenses are involved. In such unusual cases, and after approval by the Division Engineer, the permittee will be required to bear the expense of inspections in accordance with the conditions of his permit; however, the permittee will not be required or permitted to pay the United States inspector either directly or through the District Engineer. The inspector will be paid on regular payrolls or service vouchers. The District Engineer will collect the cost from the permittee in accordance with the following:

(i) At the end of each month the amount chargeable for the cost of inspection pertaining to the permit will be collected from the permittee and will be taken up on the statement of accountability and deposited in a designated depository to the credit of the Treasurer of the United States, on account of reimbursement of the appropriation from which the expenses of the inspection were paid.

(ii) If the District Engineer considers such a procedure necessary to insure the United States against loss through possible failure of the permittee to supply the necessary funds in accordance with paragraph (q)(4)(i) of this section, he may require the permittee to keep on deposit with the District Engineer at all times an amount equal to the estimated cost of inspection and supervision for the ensuing month, such deposit preferably being in the form of a certified check, payable to the order of Treasurer of the United States. Certified checks so deposited will be carried in a special deposit account (guaranty for inspection expenses) and upon completion of the work under the permit the funds will be returned to the permittee provided he has paid the actual cost of inspection.

(iii) On completion of work under a permit, and the payment of expenses by the permittee without protest, the account will be closed, and outstanding deposits returned to the permittee. If the account is protested by the permittee, it will be referred to the Division Engineer for approval before it is closed and before any deposits are returned to the permittee.

(5) If the permitted activity includes restoration of the waterway to its original condition, or if the issuing official has reason to consider that the permittee might be prevented from completing work which is necessary to protect the public interest in the waterway, he may require the permittee to post a bond of sufficient amount to indemnify the government against any loss as a result of corrective action it might take.

(r) *Publicity.* District Engineer will establish and maintain a program to assure that potential applicants for permits are informed of the requirements of this regulation and of the steps required to obtain permits for activities in navigable waters or ocean waters. Whenever the District Engineer becomes aware of plans being developed by either private or public entities who might require permits in order to implement the plans, he will advise the potential applicant in writing of the statutory requirements and the provisions of this regulation. Similarly when the District Engineer is aware of changes in Corps of Engineers regulatory jurisdiction he will issue appropriate public notices.

(s) *Reports.* The report of a District Engineer on an application for a permit requiring action by the Division Engineer or by the Chief of Engineers will be in a letter form with the application and all pertinent comments, records and studies including the final environmental impact statement if prepared, as inclosures. The following items will be included or discussed in the report:

(1) Name of applicant.

(2) Location, Character and purpose of proposed activity.

(3) Applicable statutory authorities and administrative determinations conferring Corps of Engineers regulatory jurisdiction.

(4) Other Federal, State, and local authorizations obtained or required and pending.

(5) Date of public notice and public meeting or public hearings, if held, and summary of objections offered with comments of the District Engineer thereon. The comments should explain the objections and not merely refer to inclosed letters.

(6) Views of State and local authorities.

(7) Views of District Engineer concerning probable effect of the proposed work on:

(i) Navigation, present and prospective.

(ii) Harbor lines, if established.

(iii) Flood heights, drift and flood damage protection.

(iv) Beach erosion or accretion.

(v) Conservation.

(vi) Fish and Wildlife.

(vii) Water Quality.

(viii) Aesthetics.

(ix) Ecology (General Environmental Concerns).

(x) Historic values.

(xi) Recreation.

(xii) Economy.

(xiii) Water supply.

(xiv) Land use classification and coastal zone management plans.

(xv) Public Interest (Needs and Welfare of the People).

(8) Other pertinent remarks, including:

(i) Extent of public and private need;

(ii) Desirability of using appropriate alternatives;

(iii) Extent and permanence of beneficial and/or detrimental effects; and

(iv) Probable impact in relation to cumulative effects created by other activities.

(9) A copy of the environmental assessment and summary of the environmental impact statement if prepared.

(10) A Statement of Findings as an inclosure.

(11) Conclusions.

(12) Recommendations including any proposed special conditions.

APPENDIX A—U.S. COAST GUARD/CHIEF OF ENGINEERS MEMORANDUM OF AGREEMENT

1. *Purpose and Authority:* A. The Department of Transportation Act, the Act of October 15, 1966, P.L. 89-670, transferred to and vested in the Secretary of Transportation certain functions, powers and duties previously vested in the Secretary of the Army and the Chief of Engineers. By delegation of authority from the Secretary of Transportation (49 CFR 1.46(c)) the Commandant, U.S. Coast Guard, has been authorized to exercise certain of these functions, powers and duties relating to bridges and causeways conferred by:

(1) the following provision of law relating generally to drawbridge operating regulations: Section 5 of the Act of August 18, 1894, as amended (28 Stat. 362; 33 U.S.C. 499);

(2) the following law relating generally to obstructive bridges: The Act of June 21, 1940, as amended (The Truman-Hobbs Act) (54 Stat. 497; 33 U.S.C. 511 et seq.);

(3) the following laws and provisions of law to the extent that they relate generally to the location and clearances of bridges and causeways in the navigable waters of the United States:

(a) Section 9 of the Act of March 3, 1899, as amended (30 Stat. 1151; 33 U.S.C. 401);

(b) The Act of March 23, 1906, as amended (34 Stat. 84; 33 U.S.C. 491 et seq.); and

(c) The General Bridge Act of 1946, as amended (60 Stat. 847; 33 U.S.C. 525 et seq.) except Sections 502(c) and 503.

B. The Secretary of the Army and The Chief of Engineers continue to be vested with broad and important authorities and responsibilities with respect to navigable waters of the United States, including, but not limited to, jurisdiction over excavation and filling, design flood flows and construction of certain structures in such waters, and the prosecution of waterway improvement projects.

C. The purposes of this agreement are: (1) To recognize the common and mutual interest of the Chief of Engineers and the Commandant, U.S. Coast Guard, in the orderly and efficient administration of their respective responsibilities under certain Federal statutes to regulate certain activities in navigable waters of the United States;

(2) To clarify the areas of jurisdiction and the responsibilities of the Corps of Engineers and the Coast Guard with respect to:

(a) the alteration of bridges

(1) in connection with Corps of Engineers waterway improvement projects, and

(2) under the Truman-Hobbs Act;

(b) the construction, operation and maintenance of bridges and causeways as distinguished from other types of structures over or in navigable waters of the United States;

(c) the closure of waterways and the restriction of passage through or under bridges in connection with their construction, operation, maintenance and removal; and

(d) the selection of an appropriate design flood flow for flood hazard analysis of any proposed water opening.

(3) To provide for coordination and consultation on projects and activities in or affecting the navigable waters of the United States.

In furtherance of the above purposes the undersigned do agree upon the definitions, policies and procedures set forth below.

2. *Alteration of bridges in or across navigable waters within Corps of Engineers projects:* A. The Chief of Engineers agrees to advise and consult with the Commandant on navigation projects contemplated by the Corps of Engineers which require the alteration of bridges across the waterways involved in such projects. The Chief of Engineers also agrees to include in such project proposals the costs of alterations, exclusive of betterments, of all bridges within the limits of the designated project which after consultation with the Commandant he determines to require alteration to meet the needs of existing and prospective navigation. Under this concept the federal costs would be furnished under the project.

B. The Commandant of the Coast Guard agrees to undertake all actions and assumes all responsibilities essential to the determination of navigational requirements for horizontal and vertical clearances of bridges across navigable waters necessary in connection with any navigation project by the Chief of Engineers. Further, the Commandant agrees to conduct all public proceedings necessary thereto and establish guide clearance criteria where needed for the project objectives.

3. *Alteration of bridges under the Truman-Hobbs Act:* The Commandant of the Coast Guard acknowledges and affirms the responsibility of the Coast Guard, under the Truman-Hobbs Act, to program and fund for the alteration of bridges which, as distinct from project related alterations described in paragraph 2 herein, become unreasonable obstructions to navigation as a result of factors or changes in the character of navigation and this agreement shall in no way affect, impair or modify the powers or duties conferred by that Act.

4. *Approval alteration and removal of other bridges and causeways: A. General definitions.* For purposes of this Agreement and the administration of the statutes cited in 1.A.(3) above, a "bridge" is any structure over, on or in the navigable waters of the United States which (1) is used for the passage or conveyance of persons, vehicles, commodities and other physical matter and (2) constructed in such a manner that either the horizontal or vertical clearance, or both, may affect the passage of vessels or boats through or under the structure. This definition includes, but is not limited to, highway bridges, railroad bridges, foot bridges, aqueducts, aerial tramways and conveyors, overhead pipelines and similar structures of like function together with their approaches, fenders, pier protection systems, appurtenances and foundations. This definition does not include aerial power transmission lines, tunnels, submerged pipelines and cables, dams, dikes, dredging and filling in, wharves, piers, breakwaters, bulkheads, jetties and similar structures and works (except as they may be integral features of a bridge and used in its construction, maintenance, operation or removal; or except when they are affixed to the bridge and will have an effect on the clearances provided by the bridge) over which jurisdiction remains with the Department of the Army and the Corps of Engineers under Sections 9 and 10 of the Act of March 3, 1899, as amended (33 U.S.C. 401 and 403). A "causeway" is a raised road across water or marshy land, with the water or marshy land on both sides of the road, and which is constructed in or affects navigation, navigable waters and design flood flows.

B. *Combined structures and appurtenances.* For purposes of the Act cited in 1.A.(3) above, a structure serving more than one purpose and having characteristics of either a bridge or causeway, as defined in 4.A., and some other structure, shall be considered as a bridge or causeway when the structure in its entirety, including its appurtenances and incidental features, has or retains the predominant characteristics and purpose of a bridge or causeway. A structure shall not be considered a bridge or causeway when its primary and predominant characteristics and purpose are other than those set forth above and it meets the general definitions above only in a narrow technical sense as a result of incidental features. This interpretation is intended to minimize the number of instances which will require an applicant for a single project to secure a permit or series of permits from both the Department of Transportation and the Department of the Army for each separate feature or detail of the project when it serves, incidentally to its primary purpose, more than one purpose and has features of either a bridge or causeway and features of some other structure. However, if parts of the project are separable and can be fairly and reasonably characterized or classified in an engineering sense as separate structures, each such structure will be so treated and considered for approval by the agency having jurisdiction thereover.

C. *Alteration of the character of bridges and causeways.* The jurisdiction of the Secretary of Transportation and the Coast Guard over bridges and causeways includes authority to approve the removal of such structures when the owners thereof desire to discontinue their use. If the owner of a bridge or causeway discontinues its use and wishes to remove or alter any part thereof in such a manner that it will lose its character as a bridge or causeway, the Coast Guard will normally require removal of the structure from the waterway in its entirety. However, if the owner of a bridge or a causeway wishes to retain it in whole or in part for use other than for operation and maintenance as a bridge or causeway, the proposed structure will be considered as coming within the jurisdiction of the Corps of Engineers. The Coast Guard will refer requests for such uses to the Corps of Engineers for consideration. The Corps of Engineers agrees to advise the Commandant of the receipt of an application for approval of the conversion of a bridge or causeway to another structure and to provide opportunity for comment thereon. If the Corps of Engineers approves the conversion of a bridge or causeway to another structure, no residual jurisdiction over the structure will remain with the Coast Guard. However, if the Corps of Engineers does not approve the proposed conversion, then the structure remains a bridge subject to the jurisdiction of the Coast Guard.

5. *Closure of waterways and restriction of passage through or under bridges:* Under the statutes cited in Section 1 of this Memorandum of Agreement, the Commandant must approve the clearances to be made available for navigation through or under bridges. It is understood that this duty and authority extends to and may be exercised in connection with the construction, alteration, operation, maintenance and removal of bridges, and includes the power to authorize the temporary restriction of passage through or under a bridge by use of falsework, piling, floating equipment, closure of draws, or any works or activities which temporarily reduce the navigation clearances and design flood flows, including closure of any or all spans of the bridge. Moreover, under the Ports and Waterways Safety Act of 1972, Public Law 92-340, 86 Stat. 424, the Commandant exercises broad powers in waterways to control vessel traffic in areas he determines to be especially hazardous and to establish safety zones or other measures for limited controls or conditional access and activity when necessary to prevent damage to or the destruction or loss of, any vessel, bridge, or other structure on or in the navigable waters of the United States. Accordingly, in the event that work in connection with the construction, alteration or repair of a bridge or causeway is of such a nature that for the protection of life and property navigation through or in the vicinity of the bridge or causeway must be temporarily prohibited, the Coast Guard may close that part of the affected waterway while such work is being performed. However, it is also clear that the Secretary of the Army and the Chief of Engineers have the authority, under Section 4 of the Act of August 18, 1894, as amended, (33 U.S.C. 1) to prescribe rules for the use, administration and navigation of the navigable waters of the United States. In recognition of that authority, and pursuant to Section 102 (c) of the Ports and Waterways Safety Act, the Coast Guard will consult with the Corps of Engineers when any significant restriction of passage through or under a bridge is contemplated to be authorized or a waterway is to be temporarily closed.

6. *Coordination and cooperation procedures.* A. District Commanders, Coast Guard Districts, shall send notices of applications for permits for bridge or causeway construction, modification, or removal to the Corps of Engineers Divisions and Districts in which the bridge or causeway is located.

B. District Engineers, Corps of Engineers, shall send notices of applications for permits for other structures or dredge and fill work to local Coast Guard District Commanders.

C. In cases where proposed structures or modifications of structures do not clearly fall within one of the classifications set forth in paragraph 4.A. above, the application will be forwarded with recommendations of the reviewing officers through channels to the Chief of Engineers and the Commandant of the Coast Guard who shall, after mutual consultation, attempt to resolve the question.

D. If the above procedures fail to produce agreement, the application will be forwarded to the Secretary of the Army and Secretary of Transportation for their determination.

E. The Chief of Engineers and the Commandant, Coast Guard, pledge themselves to mutual cooperation and consultation in making available timely information and data, seeking uniformity and consistency among field offices, and providing timely and

adequate review of all matters arising in connection with the administration of their responsibilities governed by the Acts cited herein.

Dated: March 21, 1973.

C. R. BENDER.

Dated: April 18, 1973.

F. J. CLARKE.

APPENDIX B—MEMORANDUM OF UNDERSTANDING BETWEEN THE SECRETARY OF THE INTERIOR AND THE SECRETARY OF THE ARMY

In recognition of the responsibilities of the Secretary of the Army under sections 10 and 13 of the Act of March 3, 1899 (33 U.S.C. 403 and 407), relating to the control of dredging, filling, and excavation in the navigable waters of the United States, and the control of refuse in such waters, and the interrelationship of those responsibilities with the responsibilities of the Secretary of the Interior under the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.), the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-666c), and the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a et seq.), relating to the control and prevention of water pollution in such waters and the conservation of the Nation's natural resources and related environment, including fish and wildlife and recreational values therein; in recognition of our joint responsibilities under Executive Order No. 11288 to improve water quality through the prevention, control, and abatement of water pollution from Federal and federally licensed activities; and in recognition of other provisions of law and policy, we, the two Secretaries, adopt the following policies and procedures:

POLICIES

1. It is the policy of the two Secretaries that there shall be full coordination and cooperation between their respective Departments on the above responsibilities at all organizational levels, and it is their view that maximum efforts in the discharge of those responsibilities, including the resolution of differing views, must be undertaken at the earliest practicable time and at the field organizational unit most directly concerned. Accordingly, District Engineers of the U.S. Army Corps of Engineers shall coordinate with the Regional Directors of the Secretary of the Interior on fish and wildlife, recreation, and pollution problems associated with dredging, filling, and excavation operations to be conducted under permits issued under the 1899 Act in the navigable waters of the United States, and they shall avail themselves of the technical advice and assistance which such Directors may provide.

2. The Secretary of the Army will seek the advice and counsel of the Secretary of the Interior on difficult cases. If the Secretary of the Interior advises that proposed operations will unreasonably impair natural resources or the related environment, including the fish and wildlife and recreational values thereof, or will reduce the quality of such waters in violation of applicable water quality standards, the Secretary of the Army in acting on the request for a permit will carefully evaluate the advantages and benefits of the operations in relation to the resultant loss or damage, including all data presented by the Secretary of the Interior, and will either deny the permit or include such conditions in the permit as he determines to be in the public interest, including provisions that will assure compliance with water quality standards established in accordance with law.

PROCEDURES FOR CARRYING OUT THESE POLICIES

1. Upon receipt of an application for a permit for dredging, filling, excavation, or other related work in navigable waters of the United States, the District Engineers shall send notices to all interested parties, including the appropriate Regional Directors of the Federal Water Pollution Control Administration, the United States Fish and Wildlife Service, and the National Park Service of the Department of the Interior, and the appropriate State conservation, resources, and water pollution agencies.

2. Such Regional Directors of the Secretary of the Interior shall immediately make such studies and investigations as they deem necessary, or desirable, consult with the appropriate State agencies, and advise the District Engineers whether the work proposed by the permit applicant, including the deposit of any material in or near the navigable waters of the United States, will reduce the quality of such waters in violation of applicable water quality standards or unreasonably impair natural resources or the related environment.

3. The District Engineer will hold public hearings on permit applications whenever response to a public notice indicates that hearings are desirable to afford all interested parties full opportunity to be heard on objections raised.

4. The District Engineer, in deciding whether a permit should be issued, shall weigh all relevant factors in reaching his decision. In any case where Directors of the Secretary of the Interior advise the District Engineers that proposed work will impair the water quality in violation of applicable water quality standards or unreasonably impair the natural resources or the related environment, he shall, within the limits of his responsibility, encourage the applicant to take steps that will resolve the objections to the work. Failing in this respect, the District Engineer shall forward the case for the consideration of the Chief of Engineers and the appropriate Regional Director of the Secretary of the Interior shall submit his views and recommendations to his agency's Washington Headquarters.

5. The Chief of Engineers shall refer to the Under Secretary of the Interior all those cases referred to him containing unresolved substantive differences of views and he shall include his analysis thereof, for the purpose of obtaining the Department of Interior's comments prior to final determination of the issues.

6. In those cases where the Chief of Engineers and the Under Secretary are unable to resolve the remaining issues, the cases will be referred to the Secretary of the Army for decision in consultation with the Secretary of the Interior.

7. If in the course of operations within this understanding, either Secretary finds its terms in need of modification, he may notify the other of the nature of the desired changes. In that event the Secretaries shall within 90 days negotiate such amendment as is considered desirable or may agree upon termination of this understanding at the end of the period.

Dated: July 13, 1967.

STEWART L. UDALL,
Secretary of the Interior.

Dated: July 13, 1967.

STANLEY RESOR,
Secretary of the Army.

APPENDIX C

Application No.______________________
Name of Applicant____________________
Effective Date_______________________
Expiration Date (If applicable)____________

DEPARTMENT OF THE ARMY

PERMIT

Referring to written request dated ____________ for a permit to:

( ) Perform work in or affecting navigable waters of the United States, upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403);

( ) Discharge dredged or fill material into navigable waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Federal Water Pollution Control Act (86 Stat. 816, P.L. 92-500);

( ) Transport dredged material for the purpose of dumping it into ocean waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (86 Stat. 1052; P.L. 92-532);

____
(Here insert the full name and address of the permittee)

is hereby authorized by the Secretary of the Army: to_______________________________
____
____
____

(Here describe the proposed structure or activity, and its intended use. In the case of an application for a fill permit, describe the structures, if any, proposed to be erected on the fill. In the case of an application for the discharge of dredged or fill material into navigable waters or the transportation for discharge in ocean waters of dredged material, describe the type and quantity of material to be discharged.)

in ___________________________________
____
____
____

(Here to be named the ocean, river, harbor, or waterway concerned.)

at ___________________________________
____
____
____

(Here to be named the nearest well-known locality—preferably a town or city—and the distance in miles and tenths from some definite point in the same, stating whether above or below or giving direction by points of compass.)

in accordance with the plans and drawings attached hereto which are incorporated in and made a part of this permit (on drawings: give file number or other definite identification marks.) Subject to the following conditions:

I. *General conditions*: a. That all activities identified and authorized herein shall be consistent with the terms and conditions of this permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the terms and conditions of this permit which may result in the modification, suspension or revocation of this permit, in whole or in part, as set forth more specifically in General Conditions j or k hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not this permit has been previously modified, suspended or revoked in whole or in part.

b. That all activities authorized herein shall, if they involve a discharge or deposit into navigable waters or ocean waters, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, and pretreatment standards established pursuant to Sections 301, 302, 306 and 307 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), or pursuant to applicable State and local law.

c. That when the activity authorized herein involves a discharge or deposit of dredged or fill material into navigable waters, the authorized activity shall, if applicable water quality standards are revised or modified during the term of this permit, be modified, if necessary, to conform with such revised or

modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

d. That the permittee agrees to make every reasonable effort to prosecute the construction or work authorized herein in a manner so as to minimize any adverse impact of the construction or work on fish, wildlife and natural environmental values.

e. That the permittee agrees that it will prosecute the construction or work authorized herein in a manner so as to minimize any degradation of water quality.

f. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspections at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

g. That the permittee shall maintain the structure or work authorized herein in good condition and in accordance with the plans and drawings attached hereto.

h. That this permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

i. That this permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

j. That this permit may be summarily suspended, in whole or in part, upon a finding by the District Engineer that immediate suspension of the activity authorized herein would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his permit should be reinstated, modified or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee if no hearing is requested, the permit will either be reinstated, modified or revoked.

k. That this permit may be either modified, suspended or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this permit or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of this permit did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been oper ting in compliance with the terms and conditions of the permit and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of this permit; or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend or revoke this pemit in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

l. That in issuing this permit, the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part, and/or the Government may, in addition, institute appropriate legal proceedings.

m. That any modification, suspension, or revocation of this permit shall not be the basis for any claim for damages against the United States.

n. That the permittee shall notify the District Engineer at what time the activity authorized herein will be commenced, as far in advance of the time of commencement as the District Engineer may specify, and of any suspension of work, if for a period of more than one week, resumption of work and its completion.

o. That if the activity authorized herein is not started on or before ------ day of ------, 19--, (one year from the date of issuance of this permit unless otherwise specified) and is not completed on or before ------ day of ------, 19--, (three years from the date of issuance of this permit unless otherwise specified) this permit, if not previously revoked or specifically extended, shall automatically expire.

p. That no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized by this permit.

q. That if the display of lights and signals on any structure or work authorized herein is not otherwise provided for by law, such lights and signals as may be prescribed by the United States Coast Guard shall be installed and maintained by and at the expense of the permittee.

r. That this permit does not authorize or approve the construction of particular structures, the authorization or approval of which may require authorization by the Congress or other agencies of the Federal Government.

s. That if and when the permittee desires to abandon the activity authorized herein, unless such abandonment is part of a transfer procedure by which the permittee is transferring his interests herein to a third party pursuant to General Condition v hereof, he must restore the area to a condition satisfactory to the District Engineer.

t. That if the recording of this permit is possible under applicable State or local law, the permittee shall take such action as may be necessary to record this permit with the Register of Deeds or other appropriate official charged with the responsibility for maintaining records of title to and interests in real property.

u. That there shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein.

v. That this permit may not be transferred to a third party without prior written notice to the District Engineer, either by the transferee's written agreement to comply with all terms and conditions of this permit or by the transferee subscribing to this permit in the space provided below and thereby agreeing to comply with all terms and conditions of this permit. In addition, if the permittee transfers the interests authorized herein by conveyance of realty, the deed shall reference this permit and the terms and conditions specified herein and this permit shall be recorded along with the deed with the Register of Deeds or other appropriate official.

II. *Special Conditions:* Here list conditions relating specifically to the proposed structure or work authorized by this permit. The following Special Conditions will be applicable when appropriate:

STRUCTURES FOR SMALL BOATS: That permittee hereby recognizes the possibility that the structure permitted herein may be subject to damage by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to insure the integrity of the structure permitted herein and the safety of boats moored thereto from damage by wave wash and the permittee shall not hold the United States liable for any such damage.

DISCHARGE OF DREDGED MATERIAL INTO OCEAN WATERS: That the permittee shall place a copy of this permit in a conspicuous place in the vessel to be used for the transportation and/or dumping of the dredged material as authorized herein.

ERECTION OF STRUCTURE IN OR OVER NAVIGABLE WATERS: That the permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the authorized structure or work, shall, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the waterway to its former conditions. If the permittee fails to comply with the direction of the Secretary of the Army or his authorized representative, the Secretary or his designee may restore the waterway to its former condition, by contract or otherwise, and recover the cost thereof from the permittee.

MAINTENANCE DREDGING: (1) That when the work authorized herein includes periodic maintenance dredging, it may be performed under this permit for ---- years from the date of issuance of this permit (ten years unless otherwise indicated); and (2) That the permittee will advise the District Engineer in writing at least two weeks before he intends to undertake any maintenance dredging.

This permit shall become effective on the date of the District Engineer's signature.

Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

Permittee

Date

By authority of the Secretary of the Army:

District Engineer

Date

Transferee hereby agrees to comply with the terms and conditions of this permit.

Transferee

Date

APPENDIX D—DELEGATION OF AUTHORITY TO ISSUE OR DENY PERMITS FOR CONSTRUCTION OR OTHER WORK AFFECTING NAVIGABLE WATERS OF THE UNITED STATES

MAY 24, 1971.

Pursuant to the authority vested in me by the Act of March 3, 1899, c. 425, Sections 10 and 14, 30 Stat. 1151, 1152, 33 U.S.C. Sections 403 and 408, and the Act of June 13, 1902, c. 1079, Section 1, 32 Stat. 371, 33 U.S.C. Section 565, I hereby authorize the Chief of Engineers and his authorized representatives to issue or deny permits for construction or other work affecting navigable waters of the United States. Except in cases involving applications for permits for artificial islands or fixed structures on Outer Continental Shelf lands under mineral lease from the Department of the Interior, the Chief of Engineers shall, in exercising such authority, evaluate the impact of the proposed work on the public interest. In cases involving applications for permits for artificial islands or fixed structures on Outer Continental Shelf lands under mineral lease from the Department of the Interior, the Chief of Engineers shall, in exercising such authority, evaluate the impact of the proposed work on navigation and national security. The permits so granted may be made subject to such special conditions as the Chief of Engineers or his authorized representatives may consider necessary in order to effect the purposes of the above Acts.

The Chief of Engineers and his authorized representatives shall exercise the authority hereby delegated subject to such conditions as I or my authorized representative may from time to time impose.

STANLEY R. RESOR,
Secretary of the Army.

APPENDIX E—DELEGATION OF AUTHORITY TO ISSUE OR DENY PERMITS FOR THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO NAVIGABLE WATERS

MARCH 12, 1973.

Pursuant to the authority vested in me by Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 86 Stat. 816, P.L. 92-500, I hereby authorize the Chief of Engineers and his authorized representatives to issue or deny permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into navigable waters at specified disposal sites. The Chief of Engineers shall, in exercising such authority, evaluate the impact of the proposed discharge on the public interest. All permits issued shall specify a disposal site for the discharge of the dredged or fill material through the application of guidelines developed by the Administrator of the Environmental Protection Agency and myself. In those cases where these guidelines would prohibit the specification of a disposal site, the Chief of Engineers, in his evaluation of whether the proposed discharge is in the public interest, is authorized also to consider the economic impact on navigation and anchorage which would occur by failing to authorize the use of a proposed disposal site. The permits so granted may be made subject to such special conditions as the Chief of Engineers or his authorized representatives may consider necessary in order to effect the purposes of the above Act, other pertinent laws and any applicable memoranda of understanding between the Secretary of the Army and heads of other governmental agencies.

The Chief of Engineers and his authorized representative shall exercise the authority hereby delegated subject to such conditions as I or my authorized representative may from time to time impose.

KENNETH E. BELIEU,
Acting Secretary of the Army.

MARCH 12, 1973.

APPENDIX F—DELEGATION OF AUTHORITY TO ISSUE OR DENY PERMITS FOR THE TRANSPORTATION OF DREDGED MATERIAL FOR THE PURPOSE OF DUMPING IT INTO OCEAN WATERS

Pursuant to the authority vested in me by Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, 86 Stat. 1052, PL 92-532, I hereby authorize the Chief of Engineers and his authorized representatives to issue or deny permits, after notice and opportunity for public hearings, for the transportation of dredged material for the purpose of dumping it in ocean waters. The Chief of Engineers and his authorized representatives shall, in exercising such authority, evaluate the impact of the proposed dumping on the public interest. No permit shall be issued unless a determination is made that the proposed dumping will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. In making this determination, those criteria for ocean dumping established by the Administrator of the Environmental Protection Agency pursuant to Section 102(a) of the above Act which relate to the effects of the proposed dumping shall be applied. In addition, based upon an evaluation of the potential effect which a permit denial will have on navigation, economic and industrial development, and foreign and domestic commerce of the United States, the Chief of Engineers or his authorized representative, in evaluating the permit application, shall make an independent determination as to the need for the dumping, other possible methods of disposal, and appropriate locations for the dumping. In considering appropriate disposal sites, recommended sites designated by the Administrator of the Environmental Protection Agency pursuant to Section 102(c) of the above Act will be utilized to the extent feasible. Prior to issuing any permit, the Chief of Engineers or his authorized representative shall first notify the Administrator of the Environmental Protection Agency or his authorized representative of his intention to do so. In any case in which the Administrator or his authorized representative disagrees with the determination of the Chief of Engineers or his authorized representative as to compliance with the criteria established pursuant to Section 102(a) of the above Act relating to the effects of the dumping or with the restrictions established pursuant to Section 102(c) of the above Act relating to critical areas, the determination of the Administrator or his authorized representative shall prevail. If, in any such case, the Chief of Engineers or his Director of Civil Works finds that, in the disposition of dredged material, there is no economically feasible method or site available other than a dumping site the utilization of which would result in noncompliance with such criteria or restrictions, he shall so certify and request that I seek a waiver from the Administrator of the Environmental Protection Agency of the specific requirements involved. Unless the Administrator of the Environmental Protection Agency grants a waiver, the Chief of Engineers or his authorized representative shall not issue a permit which does not comply with such criteria and restrictions. The permits so granted may be made subject to such special conditions as the Chief of Engineers or his authorized representatives may consider necessary in order to effect the purposes of the above Act, other pertinent laws, and any applicable memoranda of understanding between the Secretary of the Army and the heads of other governmental agencies.

The Chief of Engineers and his authorized representative shall exercise the authority hereby delegated subject to such conditions as I or my authorized representative may from time to time impose.

KENNETH E. BELIEU,
Acting Secretary of the Army.

APPENDIX G—TABLE OF CONTENTS AND LIST OF APPENDICES TO § 209.120

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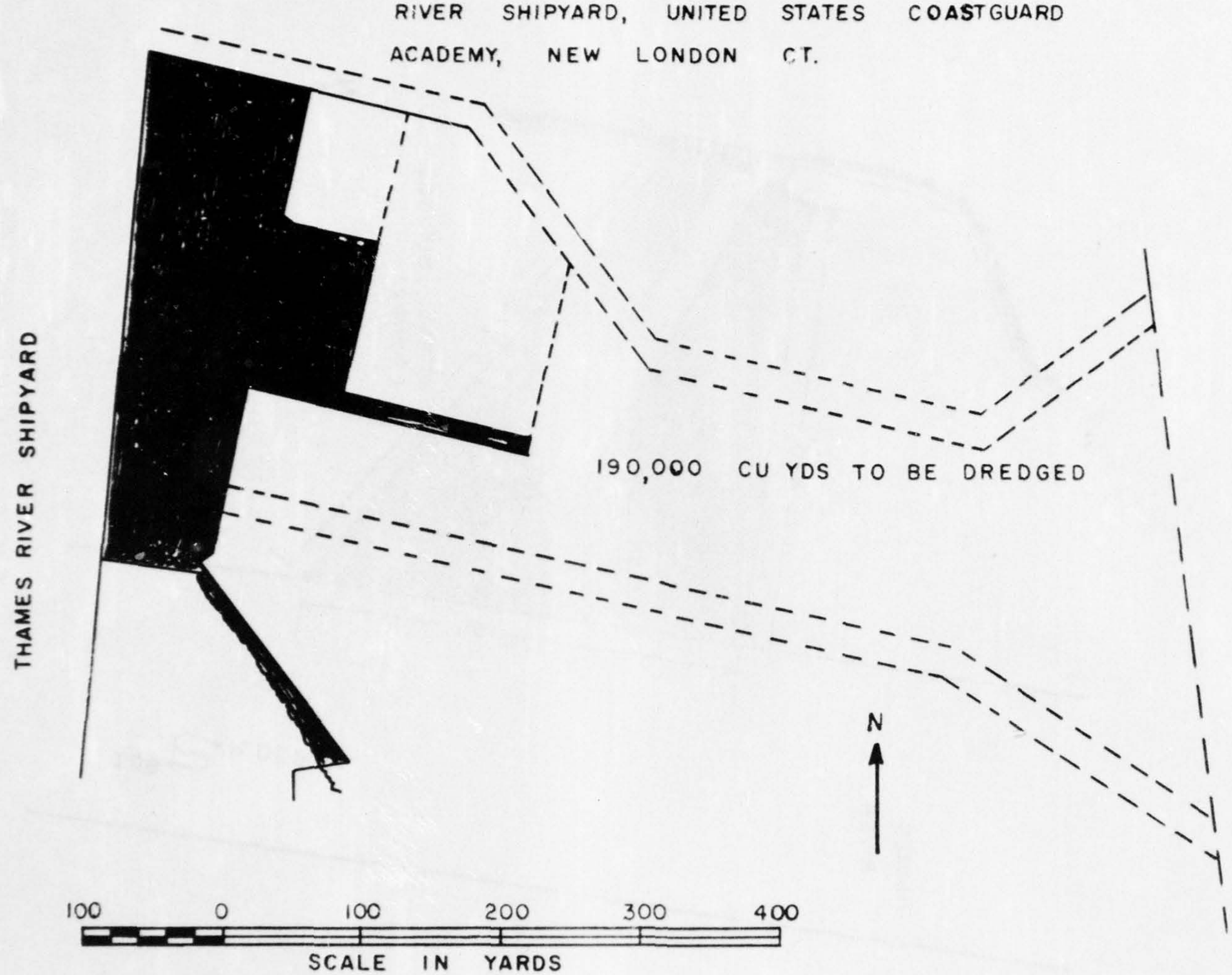
Paragraph

LIST OF APPENDICES

[FR Doc.75-19455 Filed 7-24-75;8:45 am]

APPENDIX D

FIGUIRE D-1 DREDGING REQUIREMENTS FOR THAMES RIVER SHIPYARD, UNITED STATES COASTGUARD ACADEMY, NEW LONDON CT.



AD-A031 433 NAVAL FACILITIES ENGINEERING COMMAND PHILADELPHIA PA --ETC F/G 13/2
FINAL ENVIRONMENTAL IMPACT STATEMENT, DREDGE RIVER CHANNEL: NAV--ETC(U)
SEP 76

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6 OF 7
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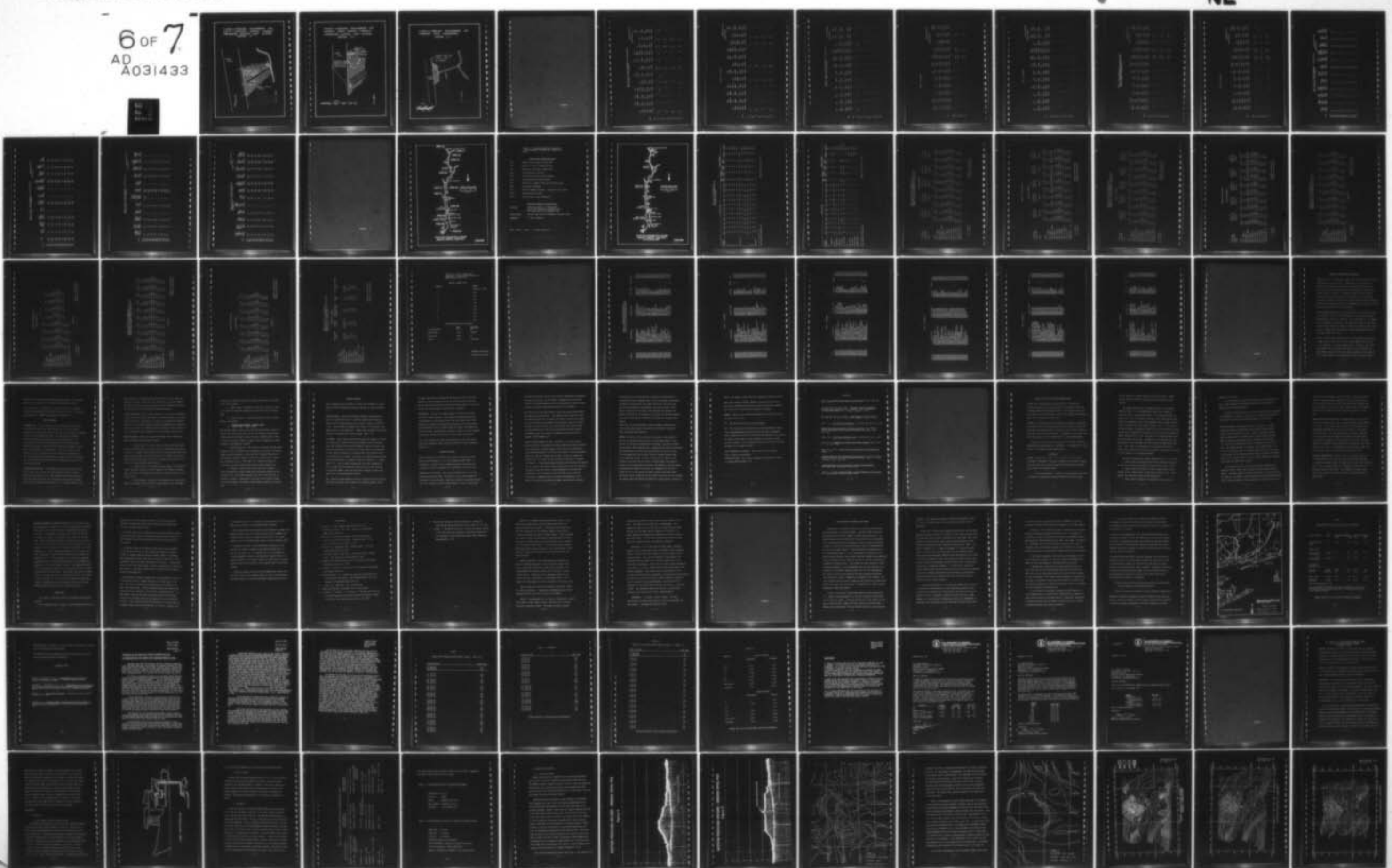

6 OF 7

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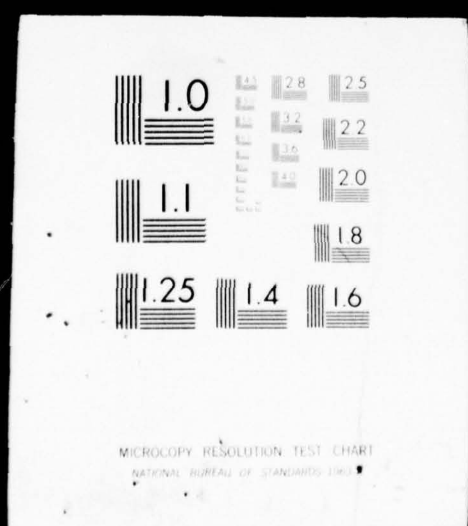


FIGURE D-2 DREDGING REQUIREMENTS FOR PIER "F" (PROPOSED) GENERAL DYNAMICS CORPORATION, ELECTRIC BOAT DIVISION, GROTON, CT.

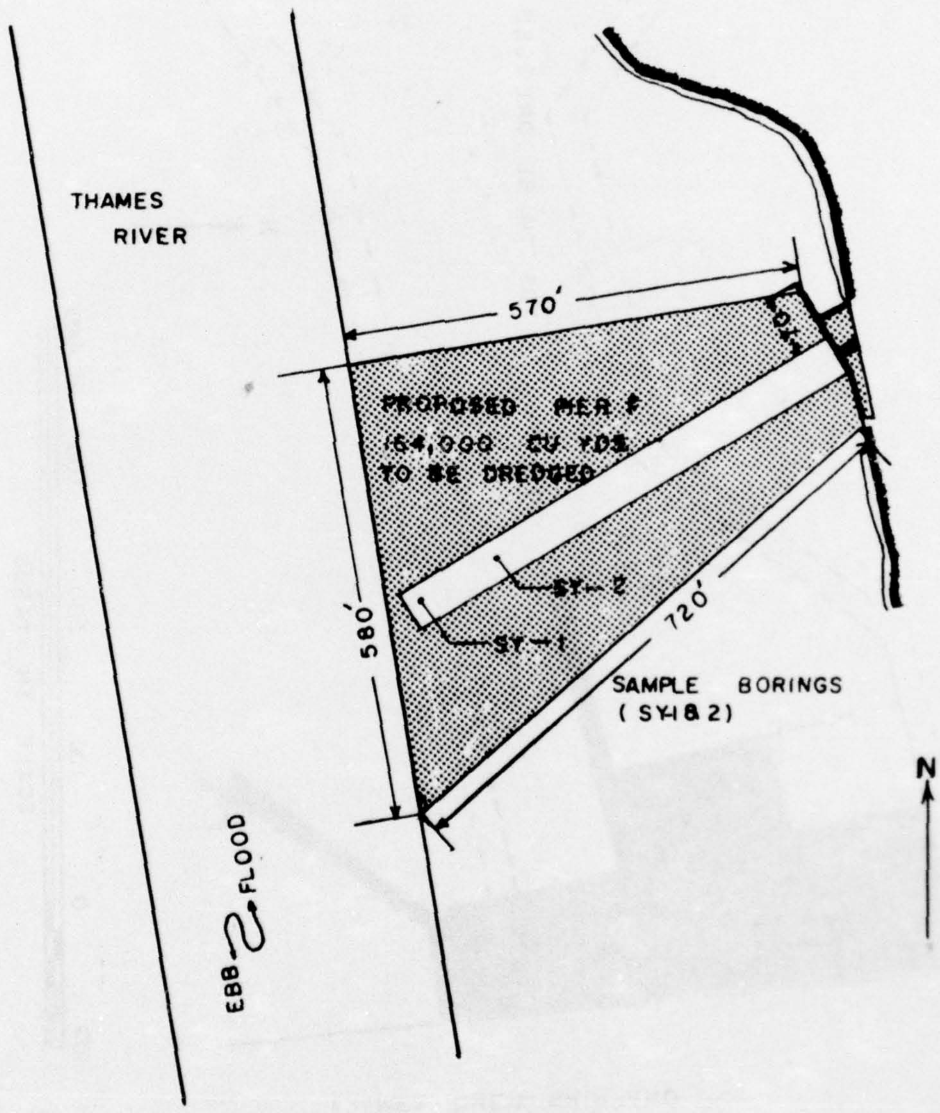


FIGURE D-3 DREDGING REQUIREMENTS FOR WETBERTH AREAS, GENERAL DYNAMICS CORPORATION, ELECTRIC BOAT DIVISION, GROTON, CT.

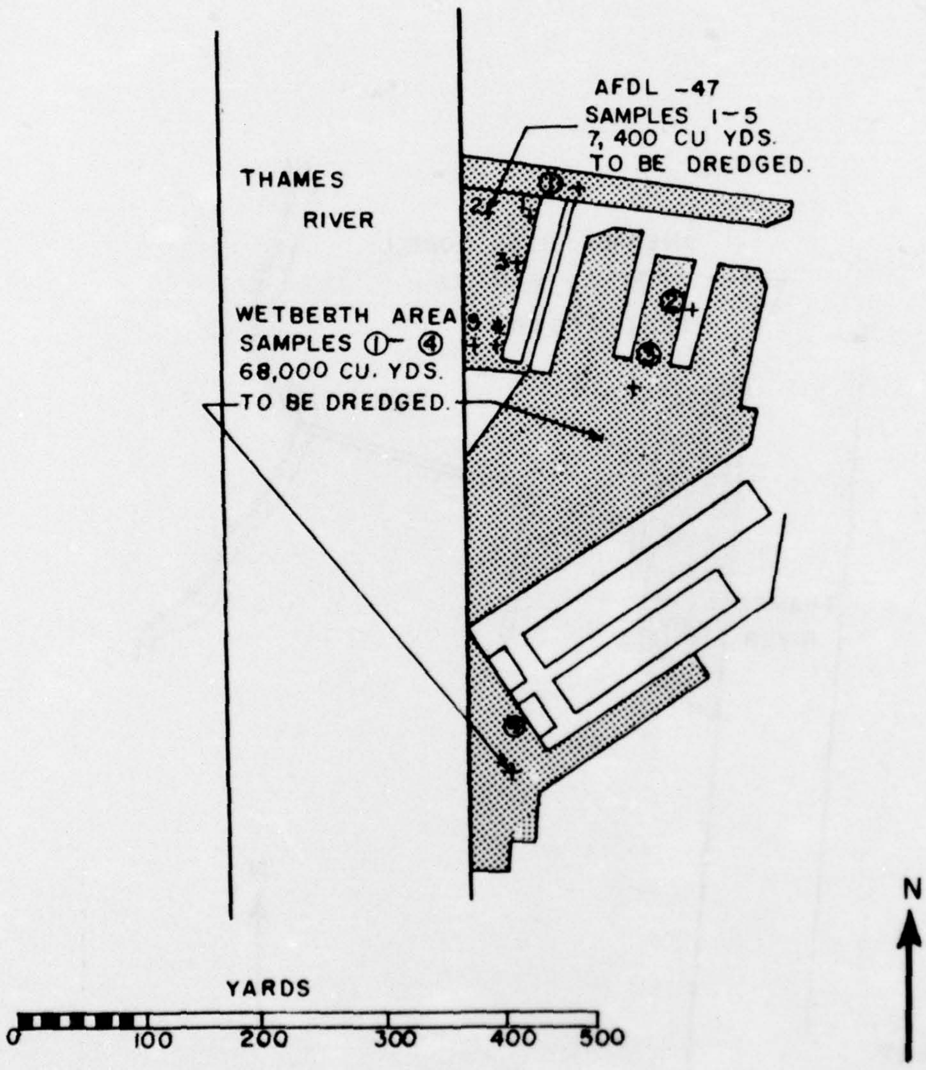
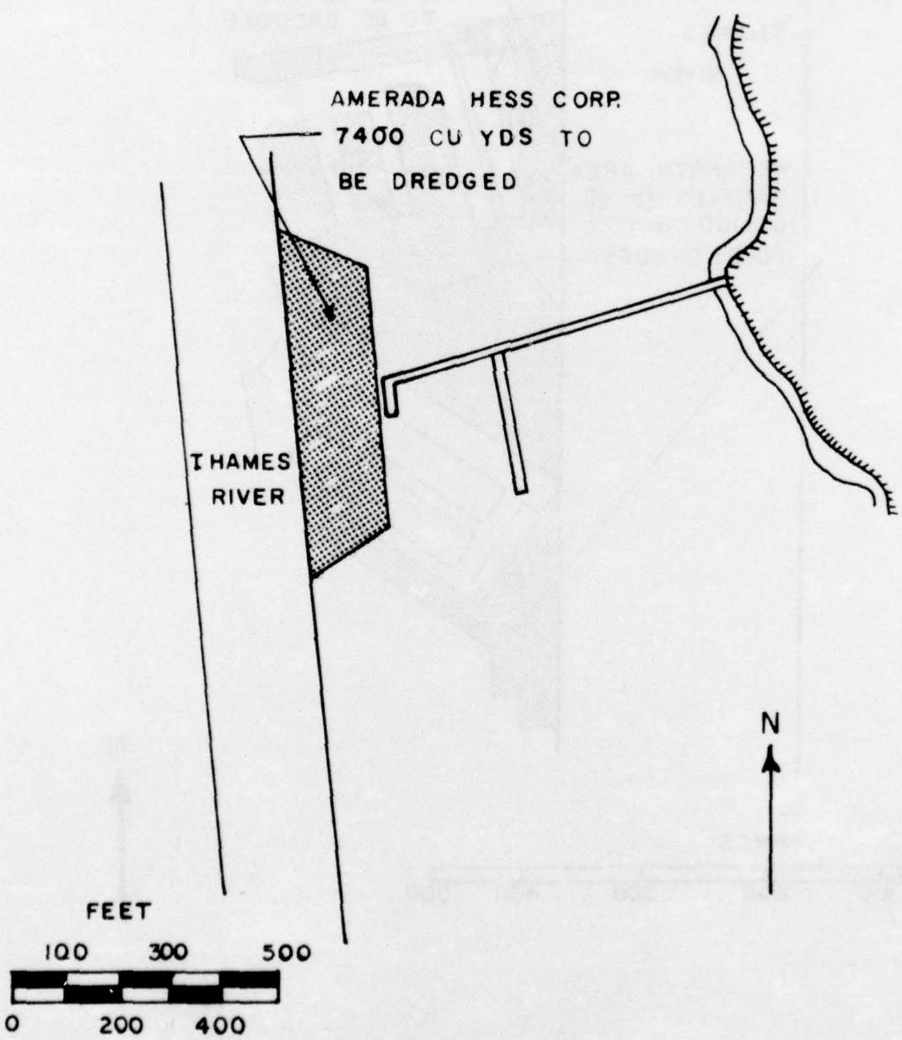


FIGURE D-4 DREDGING REQUIREMENTS FOR ALMERADA HESS CORPORATION, GROTON, CT.



APPENDIX E

TABLE E-1 01127701 - THAMES R. NR MOHEGAN, CT. WATER QUALITY DATA, WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	DIS- SOLVED SILICA (SIO2) (MG/L) (00955)	TOTAL ARSENIC IN BOTTOM DE- POSITS UG/G) (01003)	TOTAL CADMIUM IN BOTTOM DE- POSITS (UG/G) (01028)	TOTAL CHRO- MIUM IN BOTTOM DE- POSITS (UG/G) (01029)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	TOTAL COPPER IN BOTTOM DE- POSITS (UG/GO (01043)	DIS- SOLVED IRON (FE) (UG/L) (01046)	TOTAL LEAD IN BOTTOM DE- POSITS (UG/G) (01052)	TOTAL MANGA- NESE IN BOTTOM DE- POSITS (UG/L) (01053)	DIS SOLVED MAN- GANESE (MN) (UG/L) (01056)	DIS- SOLVED ZINC (ZNY) (UG/L) (01090)	TOTAL ZINC IN BOTTOM DE- POSITS (UG/G) (01093)
OCT.												
22...	6.3	--	--	--	0	--	160	--	--	20	30	--
22...	1.6	11	3	100	40	100	120	130	130	20	90	140
NOV.												
19...	7.2	--	--	--	10	--	130	--	--	30	30	--
19...	1.4	--	--	--	50	--	310	--	--	60	30	--
DEC.												
03...	6.6	--	--	--	0	--	160	--	--	40	20	--
03...	2.5	--	--	--	30	--	180	--	--	50	20	--
JAN.												
08...	7.0	--	--	--	0	--	90	--	--	20	20	--
08...	1.5	--	--	--	40	--	295	--	--	50	20	--

TABLE E-1 (continued)

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	DIS-SOLVED SILICA (SIO2) (MG/L) (00955)	TOTAL ARSENIC IN BOTTOM DE-POSITS UG/G) (01003)	TOTAL CADMIUM IN BOTTOM DE-POSITS (UG/G) (01028)	TOTAL CHRO-MIUM IN BOTTOM DE-POSITS (UG/G) (01029)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	TOTAL COPPER IN BOTTOM DE-POSITS (UG/GO (01043)	DIS-SOLVED IRON (FE) (UG/L) (01046)	TOTAL LEAD IN BOTTOM DE-POSITS (UG/G) (01052)	TOTAL MANGA-NESE IN BOTTOM DE-POSITS (UG/L) (01053)	DIS SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZNY) (UG/L) (01090)	TOTAL ZINC IN BOTTOM DE-POSITS (UG/G) (01093)
FEB.												
04...	6.6	--	--	--	0	--	80	--	--	30	20	--
MAR.												
17...	5.9	--	--	--	10	--	80	--	--	30	10	--
17...	1.1	--	--	--	40	--	120	--	--	40	30	--
APR.												
22...	4.5	--	--	--	10	--	80	--	--	40	10	--
22...	.8	--	--	--	50	--	120	--	--	40	20	--
MAY.												
20....	1.1	--	--	--	40	--	140	--	--	60	20	--
20...	4.2	--	--	--	0	--	200	--	--	30	0	--

TABLE E-2 01127701 - THAMES R. NR MOHEGAN CT. WATER QUALITY DATA
WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/21

DISTRICT CODE 09

DATE	DDD IN BOTTOM DE-POSITS (UG/KG) (39363)	DDE IN BOTTOM DE-POSITS (UG/KG) (39398)	DDT IN BOTTOM DE-POSITS (UG/KG) (39373)	DI-ELORIN IN BOTTOM DE-POSITS (UG/KG) (39383)	NDRIN IN BOTTOM DE-POSITS (UG/KG) (39393)	ETHION IN BOTTOM DE-POSITS (UG/KG) (39399)	TOX-APHENE IN BOTTOM DE-POSITS (UG/KG) (39403)	HEPTA-CHLOR IN BOTTOM DE-POSITS (UG/KG) (39413)	HEPTA-CHLOR EPOXIDE IN BOT-TOM DE-POSITS UG/KG) (39423)	PCB IN BOTTOM DE-POSITS (UG/KG) (39519)	MALA-THION IN BOTTOM DE- (UG/KG) (39531)	PARA-THION IN BOTTOM DE- (UG/KG) (39541)
OCT.												
22...	--	--	--	--	--	--	--	--	--	--	--	--
22...	8.6	.0	1.9	14	.0	.0	0	.0	.0	180	.0	.0
NOV.												
19...	--	--	--	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	---	--	--	--	--	--
DEC.												
03...	--	--	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--	--	--
JAN.												
08...	--	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-2 (continued)

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	DIAZINON IN BOTTOM DE-POSITS (UG/KG) (39571)	METHYL PARA-THION IN BOT-TOM DE-POSITS (UG/KG) (39601)	2.4-D IN BOTTOM DE-POSITS (UG/KG) (39731)	2.4.5-T IN BOTTOM DE-POSITS (UG/KG) (39741)	SILVER IN BOTTOM DE-POSITS (UG/KG) (39761)	TRI-THION IN BOTTOM DE-POSITS UG/KG) (39787)	METHYL TWI-THION IN BOT-TOM DE-POSITS (UG/KG) (39791)	DIS-SOLVED SOLIDS (RESI DUE AT 180 C) (MG/L) (70300)	DIS-SOLVED SOLIDS (TONS PER AC-FT) (70303)	DIS-SOLVED AMMONIA (NH4) (MG/L) (71846)	TOTAL NITRO-GEN (NO3) (MG/L) (71887)	TOTAL MERCURY IN BOTTOM DE-POSITS (UG/G) (71921)
APR.												
22...	--	--	--	--	--	--	--	3930	5.34	--	3.0	--
22...	--	--	--	--	--	--	--	29400	40.0	--	1.9	--
MAY												
20...	--	--	--	--	--	--	--	29500	40.1	--	2.2	--
20...	--	--	--	--	--	--	--	1330	1.51	--	2.9	--

TABLE E-2 (continued)

PROCESS DATE 06/21

DISTRICT CODE 09

DATE	DDD IN BOTTOM DE-POSITS (UG/KG) (39363)	DDE IN BOTTOM DE-POSITS (UG/KG) (39398)	DDT IN . BOTTOM DE-POSITS (UG/KG) (39373)	DI-ELORIN IN BOTTOM DE-POSITS (UG/KG) (39383)	NDRIN IN BOTTOM DE-POSITS (UG/KG) (39393)	ETHION IN BOTTOM DE-POSITS (UG/KG) (39399)	TOX-APHENE IN BOTTOM DE-POSITS (UG/KG) (39403)	HEPTA-CHLOR IN BOTTOM DE-POSITS (UG/KG) (39413)	HEPTA-CHLOR EPOXIDE IN BOT-TOM DE-POSITS UG/KG) (39423)	PCB IN BOTTOM DE-POSITS (UG/KG) (39519)	MALA-THION IN BOTTOM DE- (UG/KG) (39531)	PARA-THION IN BOTTOM DE- (UG/KG) (39541)
FEB.												
04...	--	--	--	--	--	--	--	--	--	--	--	--
MAR.												
17...	--	--	--	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--	--	--	--
APR.												
22...	--	--	--	--	--	--	--	--	--	--	--	--
22...	--	--	--	--	--	--	--	--	--	--	--	--
MAY.												
20...	--	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--	--

TABLE E-3 STATE OF CONNECTICUT, DEPT. OF ENV. PROTECTION,
01127701 - THAMES R NR MOHEGAN, CT. WATER QUALITY DATA,
WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	DI-AZINON IN BOTTOM DE-POSITS (UG/KG) (39571)	METHYL PARA-THION IN BOT-TOM DE-POSITS (UG/KG) (39601)	2.4-D IN BOTTOM DE-POSITS (UG/KG) (39731)	2.4.5-T IN BOTTOM DE-POSITS (UG/KG) (39741)	SILVER IN BOTTOM DE-POSITS (UG/KG) (39761)	TRI-THION IN BOTTOM DE-POSITS UG/KG) (39787)	METHYL TWI-THION IN BOT-TOM DE-POSITS (UG/KG) (39791)	DIS-SOLVED SOLIDS (RESI DUE AT 180 C) (MG/L) (70300)	DIS-SOLVED SOLIDS (TONS PER AC-FT) (70303)	DIS-SOLVED AMMONIA (NH4) (MG/L) (71846)	TOTAL NITRO-GEN (NO3) (MG/L) (71887)	TOTAL MERCURY IN BOTTOM DE-POSITS (UG/G) (71921)
OCT.												
22...	--	--	--	--	--	--	--	3830	5.21	.40	3.5	--
22...	.0	.0	.0	.0	.0	.0	.0	29200	39.7	.35	2.3	.3
NOV.												
19...	--	--	--	--	--	--	--	3360	4.57	.32	3.7	--
19...	--	--	--	--	--	--	--	30100	40.9	.26	2.8	--
DEC.												
03...	--	--	--	--	--	--	--	2000	27.2	.27	3.5	--
03...	--	--	--	--	--	--	--	23200	31.6	.22	3.0	--

TABLE E-3 (continued)

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	DI- AZINON IN BOTTOM DE- POSITS (UG/KG) (39571)	METHYL PARA- THION IN BOT- TOM DE- POSITS (UG/KG) (39601)	2.4-D IN BOTTOM DE- POSITS (UG/KG) (39731)	2.4.5-T IN BOTTOM DE- POSITS (UG/KG) (39741)	SILVER IN BOTTOM DE- POSITS (UG/KG) (39761)	TRI- THION IN BOTTOM DE- POSITS UG/KG) (39787)	METHYL TWI- THION IN BOT- TOM DE- POSITS (UG/KG) (39791)	DIS- SOLVED SOLIDS (RESI DUE AT 180 C) (MG/L) (70300)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71846)	TOTAL NITRO- GEN (NO3) (MG/L) (71887)	TOTAL MERCURY IN BOTTOM DE- POSITS (UG/G) (71921)
JAN.												
08...	--	--	--	--	--	--	--	4510	6.13	.18	3.9	--
08...	--	--	--	--	--	--	--	29700	40.4	.21	2.4	--
FEB.												
04...	--	--	--	--	--	--	--	4210	5.73	.10	3.4	--
MAR.												
17...	--	--	--	--	--	--	--	3320	4.52	.13	3.3	--
17...	--	--	--	--	--	--	--	29600	40.3	.24	3.0	--

TABLE E-4 01127701 - THAMES R NR MOHEGAN, CT. WATER QUALITY DATA,
WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/23/75
DISTRICT CODE 09

DATE	DIS-SOLVED SILICA (SIO2) (MG/L) (00955)	TOTAL ARSENIC IN BOTTOM DE-POSITS (UG/G) (01003)	TOTAL CADIUM IN BOTTOM DE-POSITS (UG/G) (01028)	TOTAL CHRO-MIUM IN BOTTOM DE-POSITS (UG/G) (01029)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	TOTAL COPPER IN BOTTOM DE-POSITS (UG/G) (01043)	DIS-SOLVED IRON (FE) (UG/L) (01046)	TOTAL LEAD IN BOTTOM DE-POSITS (UG/G) (01052)	TOTAL MANGA-NESE IN BOTTOM DE-POSITS (UG/G) (01053)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ZINC IN BOTTOM DE-POSITS (UG/G) (01093)
OCT.												
22...	6.3	--	--	--	0	--	160	--	--	20	30	--
22...	1.6	11	3	100	40	100	120	130	130	20	90	140
NOV.												
19...	7.2	--	--	--	10	--	130	--	--	30	30	--
19...	1.4	--	--	--	50	--	310	--	--	60	30	--
DEC.												
03...	6.6	--	--	--	0	--	160	--	--	40	20	--
03...	2.5	--	--	--	30	--	180	--	--	50	20	--
JAN.												
08...	7.0	--	--	--	0	--	90	--	--	20	20	--
08...	1.5	--	--	--	40	--	<50	--	--	50	20	--
FEB.												
04...	6.6	--	--	--	0	--	80	--	--	30	20	--
MAR												
17...	5.9	--	--	--	10	--	80	--	--	30	10	--
17...	1.1	--	--	--	40	--	120	--	--	40	30	--
APR.												
22...	4.5	--	--	--	10	--	80	--	--	40	10	--
22...	.8	--	--	--	50	--	120	--	--	40	20	--
MAY.												
20...	1.1	--	--	--	40	--	140	--	--	60	20	--
20...	4.2	--	--	--	0	--	200	--	--	30	0	--

TABLE E-5 01127701 - THAMES R NR MOHEGAN, CT. WATER QUALITY DATA,
WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	TIME	DEPTH (FT) (00003)	TEMPER-ATURE (DEG C) (00010)	AIR TEMPER-ATURE (DEG C) (00020)	WEATHER (00041)	SURFACE AREA (SQUARE MILES) (00049)	TUR-BID-ITY (JTU) (00070)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	SPE-CIFIC CON-CUDT ANCE (MICRO-MHOS (00095)	DIS-SOLVED OXYGEN (MG/L) (00030)	PER-CENT SATUR-ATION (00301)	PH (UNITS) (00400)
OCT.												
22...	1015	1.0	7.5	11.0	0	1382	1	20	5100	10.9	92	7.2
22...	1030	20	15.0	11.0	0	1382	2	2	34000	4.8	53	7.8
NOV.												
19...	0935	1.0	5.5	12.0	0	1382	2	30	4200	11.3	90	7.2
19...	0950	24	12.0	12.0	0	1382	8	6	31000	6.5	60	7.8
DEC.												
03...	0935	1.0	3.5	3.5	3	1382	3	40	3600	13.1	100	7.2
03...	0950	20	6.0	3.5	3	1382	2	7	23100	9.9	89	7.8
JAN.												
08...	1305	1.0	2.5	10.5	0	1382	2	4	5200	13.1	99	7.2
08...	1315	21	6.0	10.5	0	1382	5	2	29200	7.9	76	7.8
FEB.												
04...	0935	2.0	1.0	8.0	1	1382	2	20	4300	13.2	96	7.3
MAR.												
17...	0950	1.0	3.5	7.5	1	1382	2	9	3200	13.1	100	7.3
17...	1000	25	4.5	7.5	1	1382	2	4	25500	8.6	78	7.9
APR.												
22...	1000	1.0	9.0	10.5	1	1382	3	15	4800	9.9	87	7.3
22...	1010	20	10.0	10.5	1	1382	1	4	28000	8.8	56	7.9
MAY												
20...	1015	24.0	16.5	27.5	0	1382	2	2	29000	6.0	70	7.5
20...	1005	1.0	19.0	27.5	0	1382	2	20	2000	8.4	90	7.1

TABLE E-6 01127701 - THAMES R NR MOHEGAN, CT. WATER QUALITY DATA,
WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA-LINITY AS CACO3 (MG/L) (00410)	BICAR-BONATE (HCO3) (MG/L) (00440)	CAR BONATE (CO3) (MG/L) (00445)	SALIN-ITY (PPT) (00480)	LOSS ON IGNI-TION IN BOTTOM DE-POSITS (MG/KG) (00496)	TOTAL RESI-DUE (MG/L) (00500)	OIL AND GREASE (MG/L) (00550)	TOTAL NITRO-GEN (N) (MG/L) (00600)	TOTAL ORGANIC NITRO-GEN (N) (MG/L) (00605)	DIS-SOLVED AMMONIA NITRO-GEN (N) (MG/L) (00608)	AMMONIA NITRO-GEN (N) (MG/L) (00610)
OCT.												
22...	2.6	21	26	0	4.0	--	4160	0	.79	.26	.31	--
22...	3.1	102	124	0	29	116000	33500	1	.51	.09	.27	--
NOV.												
19...	2.7	22	27	0	3.5	--	3500	0	.84	.21	.25	--
19...	3.0	98	119	0	30	--	33600	0	.63	.27	.20	--
DEC.												
03...	1.6	13	16	0	2.0	--	2140	0	.79	.15	.21	--
03...	2.0	64	78	0	18	--	21700	0	.67	.27	.17	--
JAN.												
08...	2.8	23	28	0	5.0	--	4480	0	.88	.29	.14	--
08...	2.9	95	116	0	28	--	32900	0	.55	.23	.16	--
FEB.												
04...	2.2	22	27	0	4.0	--	4770	0	.76	.21	.08	--
MAR.												
17...	2.3	24	29	0	3.5	--	3520	0	.75	.18	.10	--
17...	2.4	98	120	0	27	--	31300	0	.67	.35	.19	--
APR.												
22...	2.2	23	28	0	3.0	--	4060	0	.67	.12	.11	--
22...	2.3	94	114	0	17	--	31700	0	.44	.24	.10	--
MAY												
20...	6.0	97	118	0	21.0	--	30400	0	.50	.19	.23	--
20...		23	28	0	1.5	--	1420	0	.65	.31	.07	--

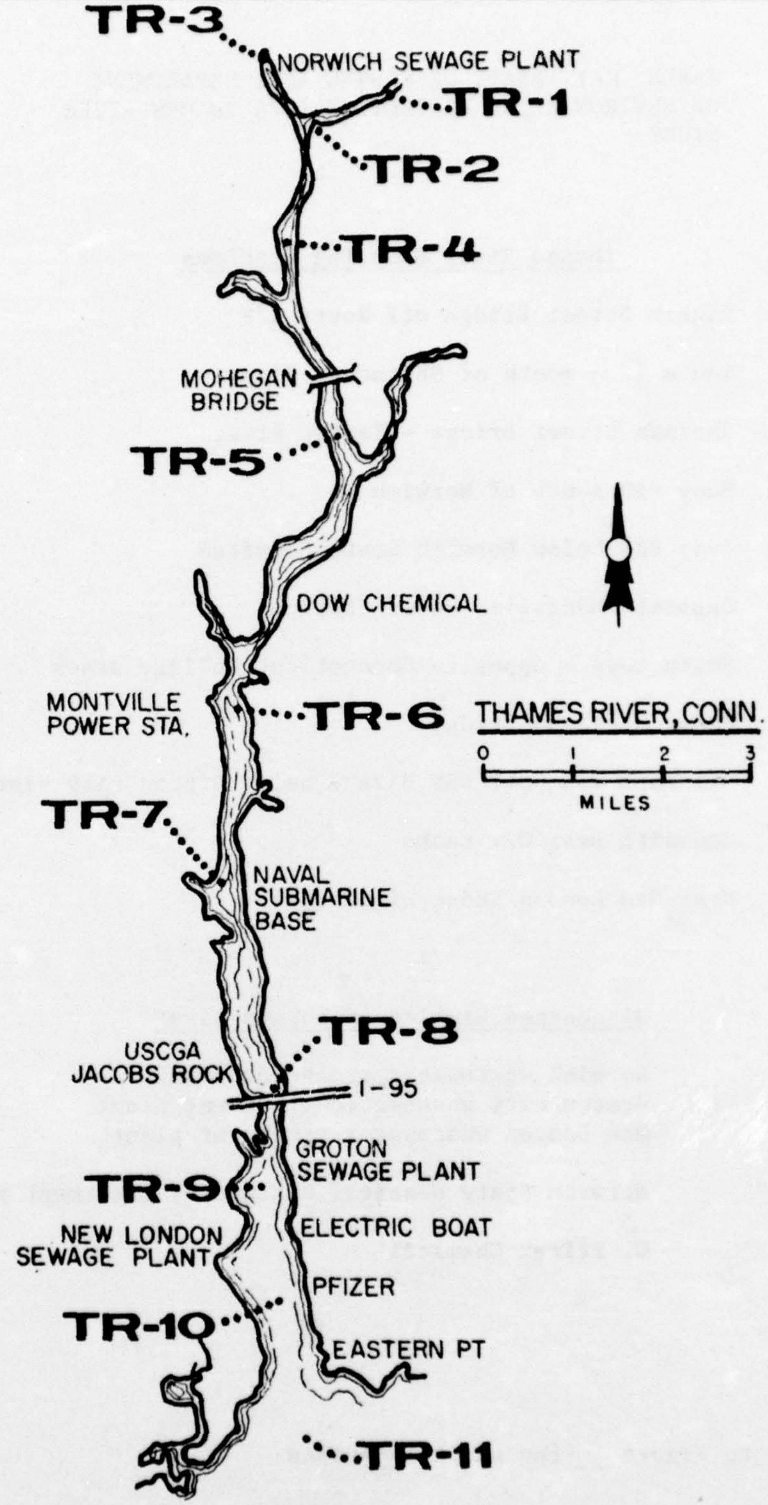
TABLE E- 7 01127701 - THAMES R NR MOHEGAN, CT.
WATER QUALITY DATA, WATER YEAR OCTOBER 1974 TO
SEPTEMBER 1975

PROCESS DATE 06/23/75

DISTRICT CODE 09

DATE	TOTAL KJEL-DAHL-NITRO-GEN (N) (MG/L) (00625)	TOTAL NITRITF PLUS NITRATE (N) (MG/L) (00630)	TOTAL PHOS-PHORUS (P) (MG/L) (00665)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	ORGANIC CARBON IN RED MA-TERIAL (C) (G/KG) (00687)	CYANIDE (CN) (MG/L) (00720)	HARD-NESS (CA,MG) (MG/L) (00900)	NON-CAR-BONATE HARD-NESS (MG/L) (00902)	DIS-SOLVED CAL-CIUM (CA) (MG/L) (00915)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L) (00925)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)
OCT.												
22...	.57	.22	.07	4.0	--	.00	1200	1100	230	1100	2100	300
22...	.36	.15	.04	14	4.1	.00	4700	4600	230	1000	16000	2400
NOV.												
19...	.46	.38	.10	5.6	--	.00	630	610	39	130	1800	260
19...	.47	.16	.13	5.7	--	.00	4800	4700	340	950	16000	2200
DEC.												
03...	.36	.53	.08	6.9	--	.01	380	360	27	75	930	150
03...	.44	.23	.08	3.2	--	.01	3900	3800	260	780	12000	1700
JAN.												
08...	.43	.45	.05	4.8	--	.00	790	770	52	160	2300	540
08...	.39	.16	.08	4.2	--	.00	5800	5200	310	1100	16000	2100
FEB.												
04...	.29	.47	.05	5.8	--	--	700	680	51	140	2300	320
MAR.												
17...	.28	.47	.05	5.4	--	.00	590	570	40	120	1700	250
17...	.54	.13	.09	2.1	--	.00	4900	4800	300	1000	16000	2200
APR.												
22...	.23	.44	.07	3.9	--	.00	570	540	45	110	2000	290
22...	.34	.10	.07	2.8	--	.00	4500	4400	310	900	16000	2200
MAY												
20...	.42	.08	.09	3.0	--	.00	3700	3600	200	770	16000	2100
20...	.38	.27	.07	7.6	--	.00	260	230	19	51	690	96

APPENDIX F



STATE OF CONNECTICUT WATER QUALITY SURVEY, JUNE 1974

FIGURE

F-1

TABLE F-1 STATE OF CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION 1974 THAMES RIVER STUDY.

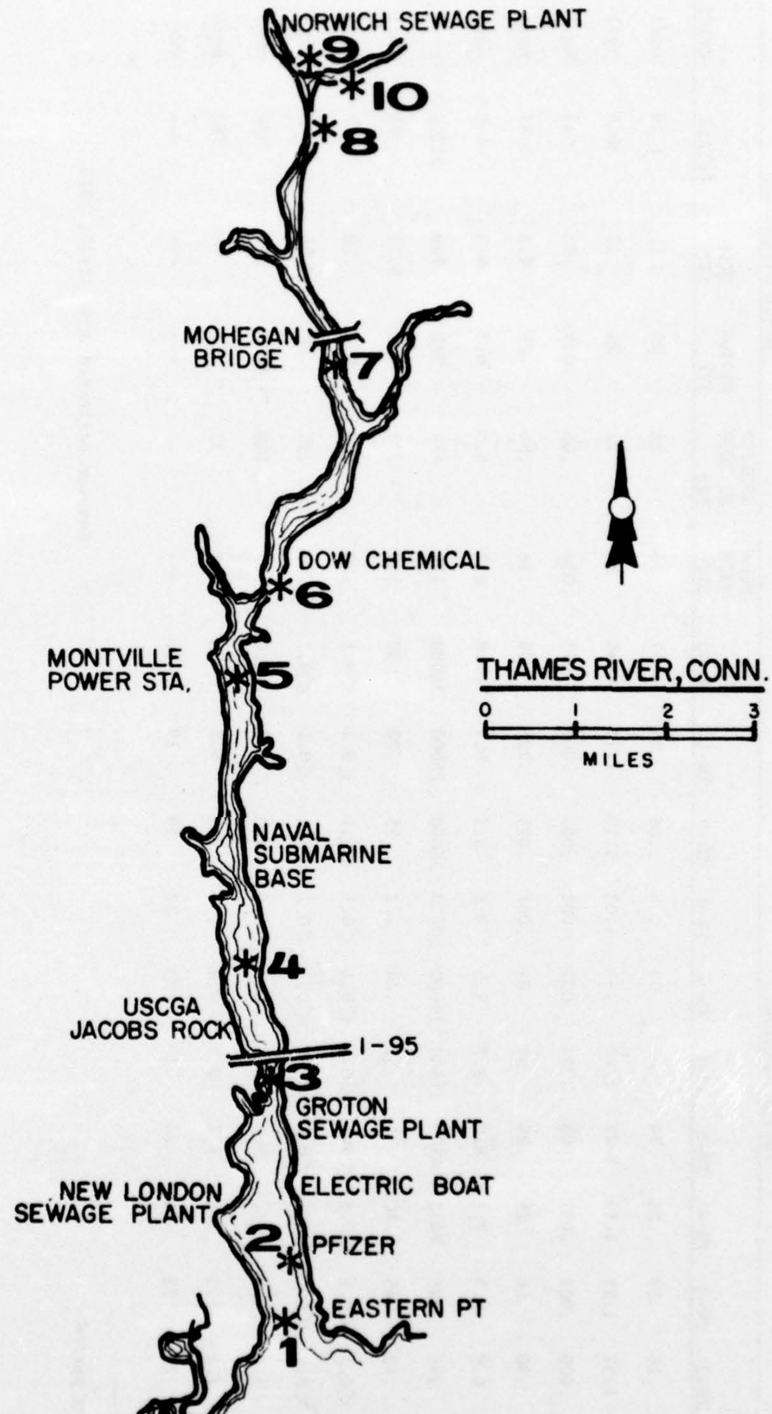
Thames River Sampling Stations

TR-1	Eighth Street Bridge off Route 12N
TR-2	Route 12 - mouth of Shetucket River
TR-3	Sherman Street Bridge - Yantic River
TR-4	Buoy #40 south of Norwich
TR-5	Buoy #26 below Norwich State Hospital
TR-6	Opposite Montville Power Station
TR-7	Smith Cove - opposite Connecticut College stack
TR-8	Under Route 95 Bridge
TR-9	Off Fort Trumball USN Base - below Groton city plant
TR-10	Opposite Hess Oil tanks
TR-11	Near New London Ledge Lighthouse

Discharges Sampled on Thames River

municipal	Norwich wastewater treatment plant Groton city wastewater treatment plant New London wastewater treatment plant
institutional	Norwich State Hospital wastewater treatment plant
industrial	C. Pfizer Chemical

NOTE: Refer to Figure __ for exact locations



STATE OF CONNECTICUT WATER QUALITY SURVEY, AUG 1975
BY RAYTHEON CORP.

FIGURE
F-2

TABLE F-2 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
1974 THAMES RIVER STUDY

	RIVER STATIONS											WASTE DISCHARGES					
Analyses* Performed	TR-1	TR-2	TR-3	TR-4	TR-5	TR-6	TR-7	TR-8	TR-9	TR-10	TR-11	NOR-WICH STP	NORWICH ST HOSP STP	GROTON STP	NLON STP	PFIZER	UNITS
NH_3	.26	.26	.29	.25	.24	.05	.03	.04	.06	.04	.07	16	12	20	17	1.20	mg/1
TKN	1.29	1.31	1.27	1.13	1.22	1.10	.93	1.03	1.10	1.14	.85	24	28	28	27	30.6	mg/1
NO_2	.007	.009	.007	.007	.008	.003	.002	.002	.002	.002	.011	.036	.05	.015	.03	.041	mg/1
NO_3	.34	.30	.66	.29	.20	.02	.01	.007	.025	.025	.06	.34	.84	.05	4.3	1.81	mg/1
Ph	6.8	6.9	6.8	7.1	8.0	8.7	8.6	8.6	8.1	8.1	7.8	6.7	6.5	6.8	6.3	6.0	mg/1
Conductivity	121	386	138	2058	4400	12400	19000	20000	26000	26000	34000	430	480	910	960	31300	---
Fe	.42	.43	.45	.40	.35	.32	.24	.23	.25	.28	.30	1.2	.72	.82	1.52	.82	mg/1
Cu	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	.20	.25	0.1	.20	.12	mg/1
Zn	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	.08	.38	.20	3.96	.48	mg/1
BOD	2.9	3.4	1.7	3.1	2.9	3.5	4.5	4.6	4.0	3.8	2.4	120	140	24.3	120	320	mg/1
TOC	8.2	7.8	6.3	7.5	7.7	9.2	8.0	7.7	7.2	6.2	6.3	61	77	31	69	183	mg/1
Temperature	23	23	23	24	24	24	23	22	19	19	16	---	---	---	---	---	°C

*Data averaged for sampling period

Samples collected June 11-12, 1975

Analyses* Performed	RIVER STATIONS TR-1	TR-2	TR-3	TR-4	TR-5	TR-6	TR-7	TR-8	TR-9	TR-10	TR-11	WASTE DISCHARGES NOR-WICH STP	NORWICH ST HOSP STP	GROTON STP	NLON STP	PFIZER	UNITS
D.O.	7.9	7.9	8.1	8.1	10.7	13.2	13.1	13.1	9.8	9.3	8.1	3.0	5.2	1.9	2.2	---	mg/1
T. Phosphorus	.13	.13	.05	.15	.12	.09	.11	.08	.10	.10	.07	4.9	6.6	6.2	5.0	1.30	mg/1
Chlorides	13.8	85	16.2	652	1530	5000	8000	8900	12000	12300	16200	66	83	190	245	15000	mg/1
Chlorophyll-a	12.3	7.1	0	8.9	9.8	34.1	16.0	6.7	0	10.7	3.6	---	---	---	---	---	mg/m^3
Pheophytin-a	59.7	62.0	22.9	27.2	41.9	22.4	34.4	32.0	38.1	21.76	13.5	---	---	---	---	---	mg/m^3
T. Coliforms	5.3	5.8	.71	$\geq$18.5	4.6	1.14	.11	.07	.02	.05	.13	$\geq$ 24	.009	$<$.003	.008	---	MPN x 10^4
Fecal Coliforms	.08	.33	.06	.78	.16	.02	.01	.005	.004	.005	.02	$\geq$ 11	$<$.003	$<$.003	.003	---	MPN x 10^4
Flow	---	---	---	---	---	---	---	---	---	---	---	1.8	22	2.0	2.8	---	MGD
Total Solids	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	42946	mg/1
Fixed Solids	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	26273	mg/1
Volatile Solids	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	16703	mg/1
Suspended Solids	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	66	mg/1

*Data averaged for sampling period

Samples collected June 11-12, 1975

TABLE F-3 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
THAMES RIVER WATER QUALITY STUDY 1975

	Station Number									
	1		2		3		4		5	
Latitude	41°19'18"		41°19'46"		41°21'40"		41°22'52"		41°25'07"	
Longitude	72°05'00"		72°04'52"		72°05'21"		72°05'28"		72°05'33"	
Date	8/6/75		8/6/75		8/6/75		8/6/75		8/6/75	
	S	B	S	B	S	B	S	B	S	B
Time	06:35	06:30	06:55	06:55	07:15	07:20	07:35	07:40	08:10	08:00
D.O. (mg/1)	5.9	7.7	5.7	7.9	5.2	6.0	5.1	5.8	4.8	4.1
BOD (mg/1)	1.9	6.2	7.0	7.0	4.5	918	5.0	5.0	3.0	8.0
Coliforms (MPN)	330	130	2400	230	230	330	330	130	460	1300
TKN (mg/1)	0.61	0.69	0.69	0.48	0.54	0.48	0.50	0.62	0.60	0.73
NH_3-N (mg/1)	0.033	0.031	0.049	0.035	0.267	0.080	0.173	0.078	0.060	0.038
NO_2-N (mg/1)	0.0016	0.0015	0.0008	0.0011	0.0028	0.0033	0.0030	0.0007	0.0032	0.0017
NO_3-N (mg/1)	0.0095	0.0027	0.0079	0.0016	0.00111	0.0019	0.0090	0.0026	0.0075	0.0031
Total P (mg/1)	0.65	0.73	0.93	0.48	0.60	0.88	0.55	0.65	0.53	0.93
Chl. a (ug/1)	63.2	44.2	65.0	45.2	55.1	58.7	55.1	74.9	52.4	60.5
Salinity (ppt)	28.0	29.7	28.5	26.7	29.7	26.0	29.2	25.4	24.8	28.6
Temperature (°C)	21.6	19.7	21.2	19.8	19.6	22.7	20.0	23.5	23.6	20.7

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-3 Continued

	Station Number									
	6		7		8		9		10	
Latitude	$41^{O}26'20''$		$41^{O}28'38''$		$41^{O}30'52''$		$41^{O}31'26''$		$41^{O}31'24''$	
Longitude	$72^{O}05'21''$		$72^{O}04'26''$		$72^{O}04'45''$		$72^{O}04'52''$		$72^{O}04'32''$	
Date	8/6/75		8/6/75		8/6/75		8/6/75		8/6/75	
	S	B	S	B	S	B	S	B	S	B
Time	07:54	07:50	07:37	07:30	07:12	07:09	06:50	06:55	06:40	06:35
D.O. (mg/1)	4.5	3.8	4.1	0.3	2.9	0.0	2.5	0.0	3.1	0.0
BOD (mg/1)	2.3	7.0	4.0	7.8	4.0	3.4	3.3	9.0	3.0	9.2
Coliforms (MPN)	1720	230	34,800	130	>161,000	34,800	>161,000	1720	>161,000	3480
TKN (mg/1)	0.59	0.81	0.59	0.61	0.68	1.15	0.78	0.76	0.74	1.21
NH_3-N (mg/1)	0.0300	0.108	0.056	0.183	0.073	0.138	0.070	0.039	0.080	0.024
NO_2-N (mg/1)	0.0032	0.0029	0.0033	0.0012	0.0021	0.0017	0.0049	0.0005	0.0010	0.0006
NO_3-N (mg/1)	0.0079	0.0027	0.0098	0.0010	0.0245	0.0016	0.0440	0.0010	0.0283	0.0011
Total P (mg/1)	0.48	1.13	0.57	1.13	0.67	1.15	0.72	0.59	0.65	0.86
Chl. a (ug/1)	62.3	83.2	153.8	25.3	108.1	11.6	174.6	25.3	116.4	18.1
Salinity	23.8	28.8	16.3	27.8	9.6	27.9	12.2	26.3	8.9	27.6
Temperature (^{O}C)	23.2	19.9	24.5	20.5	25.2	19.7	25.1	20.7	25.3	19.8

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-4 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
THAMES RIVER WATER QUALITY STUDY 1975

	Station Number									
	1		2		3		4		5	
Latitude	41°19'18"		41°19'46"		41°21'40"		41°22'52"		41°25'07"	
Longitude	72°05'00"		72°04'52"		72°05'21"		72°05'28"		72°05'33"	
Date	8/7/75		8/7/75		8/7/75		8/7/75		8/7/75	
	S	B	S	B	S	B	S	B	S	B
Time	07:20	07:15	07:40	07:30	07:45	07:55	08:20	08:10	08:40	08:35
D.O. (mg/1)	6.3	7.5	6.1	7.6	5.6	6.8	5.5	5.8	5.0	4.5
BOD (mg/1)	2.5	2.0	2.0	1.8	4.0	4.5	4.5	7.0	3.0	4.5
Coliform (mg/1)	2400	20	3480	230	460	1720	2400	230	3480	130
TKN (mg/1)	0.66	0.56	0.86	0.60	0.51	0.78	0.54	0.67	0.85	0.74
NH_3-N (mg/1)	0.0760	0.067	0.0650	0.064	0.274	0.078	0.218	0.076	0.127	0.087
NO_2-N (mg/1)	0.0027	0.0015	0.0024	0.0022	0.0025	0.0014	0.0032	0.0003	0.0021	0.0006
NO_3-N (mg/1)	0.0104	0.0026	0.0077	0.0019	0.0051	0.0027	0.0112	0.0024	0.0183	0.0031
Total P (mg/1)	0.66	0.60	0.74	0.60	0.47	0.88	0.50	0.71	1.04	0.98
Chl. a (ug/1)	62.4	54.1	66.5	54.1	70.7	70.7	58.2	58.2	47.8	11.3
Salinity (pp)	28.7	30.0	29.1	30.2	25.6	29.9	26.5	29.7	26.4	29.5
Temperature (°C)	20.5	19.7	20.2	19.7	20.8	19.8	21.5	19.9	21.5	20.2

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-4 Continued

Station Number

	6		7		8		9		10	
Latitude	41°26'20"		41°28'38"		41°30'52"		41°31'26"		41°31'24"	
Longitude	72°05'21"		72°04'26"		72°04'45"		72°04'52"		72°04'32"	
Date	8/7/75		8/7/75		8/7/75		8/7/75		8/7/75	
Time	08:56	08:51	08:30	08:35	08:12	08:05	07:50	07:45	07:30	07:23
D.O. (mg/1)	4.8	4.6	3.7	2.5	1.7	0.0	1.1	0.0	2.9	0.0
BOD (mg/1)	4.0	1.5	6.0	2.0	4.2	7.5	6.0	6.0	5.2	5.0
Coliform (MPN)	2400	230	16,100	2400	>16,100	3480	>16,100	>16,100	>16,100	>16,100
TKN (mg/1)	0.99	0.57	0.99	0.68	0.62	1.23	0.75	0.87	0.93	1.21
NH_3-N (mg/1)	0.0950	0.139	0.0510	0.150	0.2800	0.166	0.1790	0.072	0.0880	0.040
NO_2-N (mg/1)	0.0018	0.0013	0.0036	0.0014	0.0026	0.0008	0.0016	0.0005	0.0015	0.0084
NO_3-N (mg/1)	0.0040	0.0025	0.0046	0.0059	0.0175	0.0017	0.0148	0.0016	0.0270	0.0012
Total P (mg/1)	0.89	0.54	1.17	0.55	0.56	1.63	0.66	0.58	0.84	0.87
Chl. a (ug/1)	79.0	76.9	112.9	58.2	144.5	8.1	117.4	9.5	243.8	7.2
Salinity (pp)	23.4	27.2	19.9	28.0	14.2	28.2	15.8	26.8	10.6	26.7
Temperature (°C)	21.4	20.2	21.8	26.6	22.8	19.3	22.7	20.1	23.0	20.2

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-5 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
THAMES RIVER TIDAL CYCLE STUDY 1975

	1		2		3		4		5	
	S	B	S	B	S	B	S	B	S	B
Time	07:20	07:15	11:05	11:00	12:06	12:00	13:08	13:00	14:05	14:00
D.O. (mg/1)	6.3	7.5	6.5	7.6	6.4	7.4	6.3	7.3	6.2	7.4
B.O.D. (mg/1)	2.5	2.0	6.5	13.0	9.0	4.7	6.2	5.0	8.5	12.0
Coliforms (MPN)	2400	20	3480	130	3480	130	1300	310	310	130
TKN (mg/1)	0.66	0.56	0.80	0.66	0.77	0.34	0.67	0.78	0.83	0.56
NH_3-N (mg/1)	0.0760	0.067	0.077	0.069	0.076	0.042	0.068	0.072	0.123	0.082
NO_2-N (mg/1)	0.0027	0.0015	0.0055	0.0029	0.0043	0.0033	0.0004	0.0013	0.0022	0.0010
NO_3-N (mg/1)	0.0104	0.0026	0.0106	0.0049	0.0126	0.0070	0.0181	0.0032	0.0188	0.0026
Total P (mg/1)	0.66	0.60	0.86	0.67	0.65	0.46	0.46	0.58	0.42	0.42
Chl. a (ug.1)	62.4	54.1	74.8	41.6	37.4	20.8	60.8	47.8	79.0	62.4
Salinity (pp)	28.7	30.0	28.6	30.1	25.7	30.2	29.1	30.2	28.5	30.2
Temperature (^{o}C)	20.5	19.7	20.5	19.5	20.7	19.5	20.3	19.6	20.2	19.2

STATION 1

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-5 Continued

Sample Number

	6		7		8		9	
	S	B	S	B	S	B	S	B
Time	15:00	15:05	16:05	16:00				
D.O. (mg/1)	6.2	7.4	6.1	7.6	6.3	7.5	6.5	7.5
BOD (mg/1)	4.0	2.0	3.3	1.0	9.5	1.9	7.5	1.0
Coliforms (MPN)	1300	230	230	310	230	310	2400	230
TKN (mg/1)	0.71	0.73	0.75	0.64	0.79	0.60	0.43	0.65
NH_3-N (mg/1)	0.076	0.039	0.087	0.081	.0079	0.054	0.016	0.007
NO_2-N (mg/1)	0.0024	0.0017	0.0019	0.0017	0.0017	0.0017	0.0020	0.0013
NO_3-N (mg/1)	0.0039	0.0022	0.0017	0.0026	0.0078	0.0051	0.0084	0.0068
Total P (mg/1)	0.84	1.15	1.07	0.91	1.11	0.99	0.46	0.76
Chl. a (ug/1)	83.2	54.0	87.3	62.4	81.1	60.3	81.1	45.7
Salinity (pp)	28.4	30.2	28.2	30.1				
Temperature (^oC)	20.4	19.2	20.4	19.3				

STATION 1

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-6 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
THAMES RIVER TIDAL CYCLE STUDY 1975

	1		2		3		4		5	
	S	B	S	B	S	B	S	B	S	B
Time	08:40	08:35	11:08	11:04	12:06	12:01	12:56	13:00	14:30	14:26
D.O. (mg/1)	5.0	4.5	5.7	4.5	5.0	4.3	5.1	4.5	5.3	4.2
B.O.D. (mg/1)	3.0	4.5	2.8	3.5	8.0	7.2	7.8	6.0	9.5	7.8
Coliforms (MPN)	3480	130	2400	230	1300	230	2400	230	1300	1300
TKN (mg/1)	0.85	0.74	0.67	0.71	0.57	0.56	0.60	0.54	0.66	0.70
NH_3-N (mg/1)	0.127	0.087	0.262	0.086	0.188	0.082	0.130	0.068	0.230	0.099
NO_2-N (mg/1)	0.0021	0.0006	0.0043	0.0046	0.0043	0.0015	0.0036	0.0010	0.0047	0.0011
NO_3-N (mg/1)	0.0183	0.0031	0.0065	0.0053	0.0077	0.0056	0.0042	0.0099	0.0075	0.0130
Total P (mg/1)	1.04	0.98	0.60	0.59	0.68	0.74	0.56	0.72	0.48	0.63
Chl. a (ug/1)	47.8	11.3	20.8	47.8	68.6	74.8	74.8	74.8	74.8	83.2
Salinity (pp)	26.4	29.5	25.5	29.3	25.7	29.3	25.0	29.0	23.7	28.1
Temperature (^{o}C)	21.5	20.2	20.8	19.5	20.7	19.5	20.7	19.7	20.8	19.8

STATION 5

S = Surface
B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-6 Continued

Sample Number

	6		7		8		9	
	S	B	S	B	S	B	S	B
Time	15:27	15:20	16:02	15:58	17:21	17:16	18:01	17:59
D.O. (mg/1)	5.2	4.2	3.1	3.8	4.9	4.0	4.8	3.9
B.O.D. (mg/1)	3.8	2.8	2.8	4.0	2.8	2.8	2.4	2.0
Coliforms (MPN)	3480	230	16,100	130	16,100	310	1300	230
TKN (mg/1)	0.93	0.69	0.46	0.95	0.63	0.99	0.63	0.87
NH_3-N (mg/1)	0.092	0.106	0.219	0.086	0.104	0.189	0.106	0.048
NO_2-N (mg/1)	0.0034	0.0017	0.0035	0.0015	0.0030	0.0018	0.0021	0.0011
NO_3-N (mg/1)	0.0125	0.0058	0.0147	0.0117	0.0178	0.0052	0.0149	0.0052
Total P (mg/1)	1.09	0.93	0.61	1.27	0.49	1.04	0.53	0.91
Chl. a (ug/1)	79.0	62.4	89.4	68.6	89.4	87.3	87.3	94.8
Salinity (pp)	23.7	26.4	23.8	28.9	25.4	28.8	24.1	28.9
Temperature (^oC)	20.7	20.3	20.7	19.5	20.8	19.6	20.1	19.5

STATION 5

S = Surface

B = Bottom

Samples collected by
Raytheon Corporation

TABLE F-7 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATER QUALITY STUDY 1975

Composite Samples

	New London STP	Norwich STP	Norwich State Hospital STP	Groton STP	Pfizer Discharge 008
D.O. (mg/1)					
B.O.D. (mg/1)					
Coliform (MPN)	161,000	16,100,000	20	20	161,000
TKN (mg/1)	25.0	12.7	12.4	23.5	20.2
NH_3-N (mg/1)	13.0	6.5	6.0	13.1	10.4
NO_2-N (mg/1)	0.16	0.33	0.14	0.16	0.81
NO_3-N (mg/1)	0.56	1.09	0.96	0.93	2.80
Total P (mg/1)	21.4	23.3	14.7	19.2	8.3
Chlorophyll a (ug/1)					
Salinity					
Temperature (^{o}C)					

Samples collected by
Raytheon Corporation

TABLE F-8 STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATER QUALITY STUDY 1975

BENTHIC DEMAND RATES

STATION	DEMAND (gm/sq. m - dav)
1	2.99
2	2.09
3	2.60
4	1.20
5	1.36
6	3.08
7	2.11
8	3.72
9	3.09

SUPPLEMENTARY COMPOSITE SAMPLES

	BOD	Coliforms
New London STP	117.7	542
Norwich STP	86.7	160,900
Groton STP	160.8	20
Pfizer	403.8	3,480,000

Samples collected by

Raytheon Corporation

APPENDIX G

TABLE G-1 ENVIRONMENTAL PROTECTION AGENCY
NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM;
FACILITY LISTING FOR THE THAMES RIVER WATERSHED

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY / TOWN	MAJOR=M	MGD
CT0021423	BECKER CONSTRUCTION CO	WILLIMANTIC RIVER	WEST WILLING		000.00
CT0021563	BROOKLYN COOPERAGE CO	OLD STONE HILL BROOK	VERSAILLES		000.00
CT0021598	DELTA RUBBER CO	QUINEBAUG RIVER	DANIELSON		000.00
MA0101796	LEICESTER WTP	DUTTONS POND	LEICESTER/T		000.00
CT0100374	NEW LONDON-RIVERSIDE	THAMES RIVER	NEW LONDON		000.00
CT0020923	NORWICH-2ND STREET	SHETUCKET RIVER	NORWICH /T/		000.00
CT0100447	PLAINFIELD-NORTH WPCF	MOOSUP RIVER	PLAINFIELD /		000.00
MA0100901	SOUTHBRIDGE STP	QUINEBAUG RIVER	SOUTHBRIDGE		000.00
MA0025321	GOODHALLS GARAGE INC	SEPTIC TANK	SOUTHBRIDGE		000.00
CT0100811	UNIV OF CONNECTICUT PTP	FENTON RIVER	STORRS		000.00
CT0003719	AMERICAN STANDARD INC	ANGELL BROOK	PLAINFIELD		000.14
CT0002593	MAGREY MFG. CO.	APPLE TREE	MOOSUP		000.05
CT0001112	PLASTIC WIRE & CABLE CORP	ASHLAND POND	ORISWOLD		001.90
CT0003832	GENERAL DYNAMICS CORP	BAKERS COVE	GROTON		000.00
CT0002186	M.S. CHAMBERS & SON INC.	BEAVERS BROOK	SPRAGUE		000.02
CT0020770	GENERAL DYNAMICS-R & DANNEX	BIRCH PLAIN CREEK	GROTON		000.00
CT0020800	AVCO CORP	BYRAM RIVER	GREENWICH		000.00
MA0101141	CHARLTON WWTP	CADY BROOK	CHARLTON		000.00
MA0003565	CHARLTON WOOL	CADY BROOK	CHARLTON CIT	M	000.26
CT0020885	WRIGHT,KATHERIN D(1)	CAPTAIN HARBOR	GREENWICH		000.00
CT0021041	CONN PAPERBOARD CORP	CONN RIVER	PORTLAND		000.00
CT0002321	V. LA ROSA & SONS	FALL BROOK	KILLINGLY		000.02
CT0101028	WOODLAND TRAILER SALES	FINGER BROOK	WATERFORD /T		000.00
CT0000736	C E M COMPANY	FIVE MILE RIVER	KILLINGLY	M	000.05
CT0000523	GLASS CONTAINERS CORP	FIVE MILE RIVER	KILLINGLY		000.86
CT0000574	HALE MFG CO	FIVE MILE RIVER	KILLINGLY	M	000.20
CT0002101	WILLIAM PRYN INC	FIVE MILE RIVER	DAYVILLE	M	000.42

TABLE G-1 (CONTINUED)

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY/TOWN	MAJOR=M	MGD
MA0000060	ANGLO FABRICS CO	FRENCH RIVER	WEBSTER	M	001.00
MA0000094	ARDLOCK CORP	FRENCH RIVER	DUDLEY		000.10
CT0001678	BELDING CHEMICAL-FRENCH RIVER	FRENCH RIVER	THOMPSON	M	000.16
MA0002151	C.W.M. ELECTROPLATERS, INC	FRENCH RIVER	LEICESTER		000.02
CT0002224	COLT'S PLASTICS CO INC	FRENCH RIVER	THOMPSON		000.02
CT0000175	DERAN CONFECTIONERY CO	FRENCH RIVER	THOMPSON		000.08
MA0100706	DUDLEY SEWER DEPT	FRENCH RIVER	DUDLEY /T/		000.00
CT0020893	MARIANAPOLIS PREPARATORY SCH	FRENCH RIVER	THOMPSON		000.00
MA0100170	OXFORD-RDCHDALE SD	FRENCH RIVER	ROCHDALE /V/		000.00
CT0021598	DELTA RUBBER CO	PLAINFIELD MTP	MOOSUP		000.00
MA0001228	STEVENS LINEN ASSOCIATES INC	FRENCH RIVER	DUDLEY		000.76
MA0004324	WEBSTER LENS COMPANY	FRENCH RIVER	DUDLEY		000.06
MA0100439	WEBSTER MTP	FRENCH RIVER	WEBSTER		000.00
MA0004839	CARLETON WOOLEN MILLS	FRENCH RIVER	ROCHDALE	M	000.50
CT0021466	SCHWANDA PLASTICS INC	FURNACE BROOK			000.00
CT0001368	WARREN WOOLEN COMPANY	FURNACE BROOK	STAFFORD		000.21
CT0002500	WILLINGTON NAME PLATE	GINGERBROOK	STAFFORD SPR		000.01
CT0090181	(US) NAVAL SUB BASE, NEW LONDON	GOSS COVE (THAMES RI)	GROTON /T/		000.00
CT0100234	GREENWICH-CENTRAL STP	GREENWICH HARBOR	GREENWICH		000.00
CT0000701	INTERROYAL CORP	HORSE BROOK	PLAINFIELD		000.13
CT0000949	PERVEL INDUSTRIES	HORSE BROOK	PLAINFIELD		000.44
CT0020451	CENTRAL VERMONT RAILWAY INC	HOUSATONIC RIVER	DERBY		000.00
MA0004171	WORCESTER SPINNING & FINISHING	KETTLE BROOK	LEICESTER	M	000.15
CT0000108	ANGUS PARK WOOLEN CO	LITTLE RIVER	SPRAGUE		000.05
CT0003751	FEDERAL PAPER BOARD CO INC	LITTLE RIVER	VERSAILLES	M	007.90

TABLE G-1 (CONTINUED)

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY/TOWN	MAJOR=M	MGD
CT0001864	NATIONAL CHROMIUM CO INC	LITTLE RIVER	PUTNAM		000.02
CT0002372	PUTNAM WATER DEPT	LITTLE RIVER	WOODSTOCK		001.60
CT0090115	(US) COAST GUARD-NEW LONDON (N)	LONG ISLAND SOUND	NEW LONDON C		000.00
CT0020362	HITE, GEORGE (I)	LONG ISLAND SOUND	GREENWICH		000.00
CT0020851	SUPPER, F M (I)	LONG ISLAND SOUND	GREENWICH		000.00
CT0002780	STAFFORD CORP-LINATEX CORP	MIDDLE RIVER	STAFFORD SPR		000.01
MA0000329	CRANSTON PRINT WORKS CO	MILL BROOK	WEBSTER	M	002.30
MA0002313	GORDAN CHEMICAL CO.	MILL CANAL	OXFORD		000.24
CT0000221	BRUNSWICK WORSTED MILLS INC	MOOSUP RIVER	MOOSUP		000.02
CT0000248	CASE & RISLEY PRESS PAPER INC	MOOSUP RIVER	ONECO	M	000.15
CT0000558	GRISWOLD RUBBER CO	MOOSUP RIVER	MOOSUP		000.25
CT0000710	KAMAN CORP-KAMAN AEROSPACE COR	MOOSUP RIVER	MOOSUP		000.50
CT0000990	REVERE TEXTILE PRINTS CORP	MOOSUP RIVER	STERLING		000.01
CT0002089	WILLIMANTIC WATER DEPT	NATCHAUG RIVER	MANSFIELD		007.00
CT0001015	ROBERTSON PAPER BOX-PAPERBOARD	OXOBOXO RIVER	MUNTVILLE	M	000.58
CT0003158	THOMAS C FARIA CORP	OXOBOXO RIVER	UNCASVILLE		020.00
CT0022047	JONES & LAUGHLIN STEEL CORP	WILLIMANTIC STP	WILLIMANTIC		000.00
CT0003841	GENERAL DYNAMICS CORP	POQUONNOCK	GROTON		000.00
CT0004073	GROTON FILTRATION PLANT	POQUONNOCK RIVER	GROTON		011.00
CT0000884	NEW HAVEN TRAP ROCK CO PLANT #2	QUANDOCK BROOK	KILLINGLY		003.00
MA0001023	WEST DUDLEY PAPER-R.I.CARDBOAR	QIOMEBAIG	WEST DUDLEY	M	000.96
CT0003972	ROGERS CORP - MAIN PLANT	QUINEBAUG BASIN	KILLINGLY	M	004.20
MA0003361	AMERICAN OPTICAL CORP	QUINEBAUG RIVER	SOUTHBRIDGE	M	022.00
CT0020265	ARROW-HART INC-BROOKLYN	QUINEBAUG RIVER	BROOKLYN /T/		000.00
CT0003000	BELDING HEMINGWAY-POWHATTAN MI	QUINEBAUG RIVER	PUTNAM	M	000.26

TABLE G-1 (CONTINUED)

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY/TOWN	MAJOR=M	MGD
CT0100153	DANIELSON WTP	QUINEBAUG RIVER	DANIELSON		000.00
MA0000205	GALILEO ELECTRO OPTICAL	WORCESTER MTP	STURBRIDGE		000.07
CT0100269	JEWETT CITY WTP	QUINEBAUG RIVER	JEWETT CITY		000.00
CT0002658	LEO READY-MIX CONCRETE-SCREEN	QUINEBAUG RIVER	THOMPSON		000.06
CT0020567	METALMAST MARINE INC	QUINEBAUG RIVER	PUTNAM		000.00
CT0100960	PUTNAM WPCF	QUINEBAUG RIVER	PUTNAM		000.00
MA0003972	RUSSELL HARRINGTON CUTLERY	QUINEBAUG RIVER	SOUTHBRIDGE		000.01
MA0100421	STURBRIDGE MUNI TREAT PLANT	QUINEBAUG RIVER	STURBRIDGE		000.00
CT0100706	THOMPSON SATF	QUINEBAUG RIVER	THOMPSON /T/		000.00
CT0002429	WYCKOFF STEEL-AMPCO PITTSBURG	QUINEBAUG RIVER	PUTNAM		000.40
CT0002291	WYRE WYND INC	QUINEBAUG RIVER	GRISWOLD		000.23
CT0002381	PUTNAM-HERZL FINISH CO	QUINNEBAUG	PUTNAM		000.15
CT0002135	ERNEST JOLY & SONS INC	QUONODOCK BROOK	KILLINGLY		000.15
CT0000264	CHAMBERS-STORCK CO	SHETUCKET RIVER	NORWICH		000.01
CT0001651	ARTISTIC WIRE PROD. CO	SHETUCKET RIVER	TUSTVILLE	M	000.10
CT0002763	ATLANTIC CARTON CORP	SHETUCKET RIVER	NORWICH		000.01
CT0004090	HAINE BROTHERS INC	SHETUCKET RIVER	WINDHAM		000.00
CT0003174	KING-SEELEY THERMOS-TAFT, PLT	SHETUCKET RIVER	NORWICH	M	000.10
CT0004197	KING-SEELEY THERMOS-TAFTSVILLE	SHETUCKET RIVER	NORWICH		000.10
CT0020915	NORWICH-OCCUM HYDRO	SHETUCKET RIVER	NORWITH /T/		000.00
CT0020907	NORWICH-10TH STREET	SHETUCKET RIVER	NORWICH/T/		000.00
CT0003387	ROGERS CORP-ENGINEERED PROD DI	SHETUCKET RIVER	SOUTH WINDHA		001.10
CT0002771	SINCLAIR + VALENTINE-WHEELABRA	SHUTUCKET RIVER	NORWICH		000.02
CT0100978	SPRAGUE STP	SHETUCKET RIVER	BALTIC		000.00
CT0004146	WAKEFIELD INDUSTRIES	SHETUCKET RIVER	NORWICH		000.04
MA0001651	HYDE MANUFACTURING COMP	STORM SEWER	SOUTHBRIDGE		000.07
CT0100439	PLAINFIELD MTP	THAME	PLAINFIELD /		000.00

TABLE G-1 (CONTINUED)

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY/TOWN	MAJOR=M	MGD
CT0090123	(US) COAST GUARD-NEW LONDON (B)	THAMES RIVER	NEW LONDON C		000.00
CT0090042	(US) NAVAL SUB BASE, NEW LONDON	THAMES RIVER	GROTON /T/		000.00
CT0090034	(US) NAVAL SUB BASE, NEW LONDON	THAMES RIVER	GROTON /T/		000.00
CT0090018	(US) NAVAL SUB BASE, NEW LONDON	THAMES RIVER	GROTON /T/		000.00
CT0090026	(US) NAVAL SUB BASE, NEW LONDON	THAMES RIVER	GROTON /T/		000.00
CT0003115	CONN. LIGHT & POWER-MONTVILLE	THAMES RIVER	MONTIVLLE	M	423.00
CT0003131	DOW CHEMICAL-ALLYNS POINT	THAMES RIVER	GALES FERRY	M	001.80
CT0002445	FUSCONI CLEANERS	THAMES RIVER	GROTON		000.01
CT0020796	GENERAL DYNAMICS-ELECT. BOAT	THAMES RIVER	GROTON /T/		000.00
CT0003824	GENERAL DYNAMICS-ELECT. BOAT	THAMES RIVER	GROTON	M	002.50
CT0100242	GROTON-FORT STREET PAR	THAMES RIVER	GROTON /T/		000.00
CT0001805	HESS OIL-CHEMICAL DIV	THAMES RIVER	GROTON		000.01
CT0003182	KING-SEELEY THERMOS CO. LAUREL	THAMES RIVER	NORWICH		000.19
CT0003921	NAVAL SUB BASE, NEW LONDON	THAMES RIVER	GROTON		020.00
CT0002895	NAVAL UNDERWATER SYSTEM CENTER	THAMES RIVER	NEW LONDON		000.50
CT0100382	NEW LONDON(TRUMBELL ST) WPCF	THAMES RIVER	NEW LONDON		000.00
CT0100421	NORWICH HOSPITAL MUNI TREAT	THAMES RIVER	PRESTON		000.00
CT0000914	NORWICH HOSPITAL-STATE OF CT	THAMES RIVER	PRESTON		000.60
CT0100412	NORWICH MTP	THAMES RIVER	NORWICH /T/		000.00
CT0000957	PFIZER INC	THAMES RIVER	GROTON	M	114.00
CT0100587	UNCAS ON THAMES HOSP PTP	THAMES RIVER			000.00
CT0000426	DUPONT-RED TAG INC	TRADING COVE BR	NORWICH		000.01
CT0002798	INTERNATIONAL PAPER-PUTNAM	UNNAMES TRIBU	PUTNAM		000.03
CT0000043	ACME COTTON PRODUCTS	WETSTONE BROOK	EAST KILLING	M	000.13
CT0002062	IDLE WILD FARM INC	WHITE BROOK	POMFRET		000.02

TABLE G-1 (CONTINUED)

NPDES NO.	APPLICANT NAME	RECEIVING WATERS	CITY/TOWN	MAJOR=M	MGD
CT0002950	AMERICAN THREAD CO-WILLIMANTIC	WILLIMANTIC RIVER	WILLIMANTIC	M	002.50
CT0003018	BRAND-REX CO., AKZONA INC.	WILLIMANTIC RIVER	WILLIMANTIC		000.46
CT0003140	ELECTRO-MOTIVE MFG CO PLANT #1	WILLIMANTIC RIVER	WILLIMANTIC		000.03
CT0101206	MANSFIELD STATE TRAIN. SCH PTP	WILLIMANTIC RIVER	MANSFIELD DE		000.00
CT0002941	AMF CUNO, AMF INC.	WILLIMANTIC RIVER	STAFFORD SPR		000.10
CT0021504	ROGERS CORP	MAY BROOK	EAST WOODSTO		000.00
MA0023485	GLASS GUARD IND INC	FRENCH RIVER	WEBSTER/T		000.00
CT0100544	STONINGTON (MYSTIC)	MYSTIC RIVER	WILLIMANTIC		000.00
CT0101249	NORWALK STP	NORWALK RIVER	NORWALK		000.00
CT0021563	BROOKLYN COOPERAGE CO	OLD STONE MILL BROOK	VERSAILLES		000.00
CT0021300	DELTA RUBBER CO - DANIELSON PL	QUINEBAUG RIVER	DANIELSON		000.00
CT0100153	DANIELSON WTP	QUINEBAUG RIVER	DANIELSON		000.00
CT0022080	C&M CORP	QUINEBAUG RIVER	WAUREGAN		000.00
CT0022071	MOLDEX INC	QUINEBAUG RIVER	WAUREGAN		000.00
CT0022063	WAM REALTY	QUINEBAUG RIVER	WAUREGAN		000.00
CT0101214	STAFFORT MTP	WILLIMANTIC RIVER	STAFFORD/T		000.00
CT0021385	USS FULTON	NEW LONDON	NEW LONDON		000.00
CT0021636	(US) COAST GUARD RES & DEV CIR	THAMES RIVER	NEW LONDON		000.00
CT0020966	RIVERVIEW APARTMENTS	THAMES RIVER	NORWICH		000.00
CT0101184	GROTON	THAMES RIVER	GROTON BORO		000.00
CT0020672	KING SEALY THERMOS CO THERMOS	SHETUCKET RIVER	NORWICH		000.00

APPENDIX H

ANALYTICAL AND SAMPLING METHODOLOGY

Eighteen 2 1/4" I.D. piston core samples were collected using a modified Ewing piston corer and a 300 lb. weight with a 10 foot free fall. A twenty foot long barrel was used for all sample sites except 3N, 10S, and 14S (10 foot barrel) and 17S (30 foot barrel). Trigger corer samples were not retained. The length of sample penetration ratio for most samples were unusually low, apparently due to the greater penetration resistance offered by the underlying brown plastic sediments. All cores were labled according to corresponding pier locations; sections labeled and stored at 40 ^{o}F until processed.

Bacteriological Samples were collected from the top sections of eleven cores after the water and silt had settled, using a sterilized spoon and placing the spoonful of material into a sterilized jar. All samples were refrigerated, transported to the laboratory within 24 hours after collection and analyzed for total coliform, fecal coliform, fecal streptococci, staphylococci and salmonella using standard membrane filter techniques, APHA, 1971 (10).

Benthic organisms were collected using a large Petersen grab, having a sample area of 187 sq. in. (.121m), and a sample volume of 420 cu. in. (6884 cm). The grab weighed 90 lbs. (40.8 kg). One or two grab samples were collected at each station. In all instances the grab samples completely filled the sampling apparatus thereby giving a full volume sample. On deck observations were recorded of sample

appearance and then washed through 8mm and 1mm screens. The remaining animals were preserved in a 10% seawater-formaldehyde solution.

In the laboratory, the samples were sorted, counted, and classified to phyla using standard procedure and references (6,7,8). The results were normalized to numbers of organisms per square foot.

PHYSICAL METHODS

HYDROMETER TEST. A moist sample was sieved through a bank of sieves to separate the coarse and fine fractions; the 74 micron size was selected as the low cut-off of the coarse fraction. The material retained on each sieve was weighed and noted. The fine fraction collected below the 74 micron sieve was used for the hydrometer test (4). The settling fluid used in the hydrometer test was the New London dump site bottom water. Before the fine fraction was allowed to settle out in the hydrometer, the carbonates, in the form of shells, were removed so as not to interfere with the 'flocsize' settling activity. Organic material was retained in the sample to allow for consideration of the natural adhesive and cohesive properties of the total sediment during settling.

STANDARD GRAIN SIZE TEST. The sediment sample was oven dried at 105 ^{o}C for 24 hours. The dry sample was pulverized and sieved to separate coarse and fine fractions (4). The aggregate fine fraction retained in the pan below the finest sieve (74 micron) was used for the hydrometer test. This material was treated to remove organic matter and car-

bonate material. The aggregate was deflocculated using the commercial ingredient 'Calgon'. These tests were conducted in a constant temperature bath. The settling times resulting from this standard test reflect the settling rates of the individual suspended particles.

SORTING COEFFICIENT: The sorting coefficient is an index of uniformity of grain sizes and reflects the range of conditions present in the water system (velocities, turbulance, etc.) and, to some degree the distance traveled in the settling chamber. Well-sorted sediments have coefficient values of less than 2.5; moderately sorted (normally sorted) of from 2.5 to 4.0; and poorly sorted sediments have values higher than 4.0 (11).

BEHAVIOR INDICES: These tests include Atterberg limits (liquid and plastic limits) and natural water content.

1. Liquid Limit - The lower limit of viscous flow above which the soil and water flow as a viscous liquid and below which the mixture is plastic. A Casandre Liquid Limit device was used for these tests. The water content at which the groove closed after 25 "drops" of the cup is defined as the liquid limit. The soils in question were observed to be close to the natural water content values.

2. Plastic Limit - The boundary between plastic and semi-solid states. The water content at which a sample of soil begins to crumble when rolled into 1/8" diameter thread under the palm of the hand is the plastic limit.

3. Water Content - The ratio of the weight of the interstitial water to the weight of the solids in a given mass of soil. The weight

of water is the weight of water lost during oven drying of the sample at 105 ^{o}C for 24 hours.

4. Plastic Index - A measure of plasticity of the soil, and is the numerical difference between the liquid limit and the plastic limit.

5. Liquidity Index - Is the water plasticity ratio as determined by the equation:

$$I_L = \frac{\text{NATURAL WATER CONTENT - PLASTIC LIMIT}}{\text{LIQUID LIMIT - PLASTIC LIMIT}}$$

The liquidity index is unity for soils whose natural water content is equal to the liquid limit, and zero for soils having a natural water content equal to the plastic limit; the term is applied only to plastic soils. A liquidity index of 1 implies that the sample has a shear strength of approximately 25 gm/cm^2.

6. Settling Velocity - The velocity of an object falling freely through a fluid is dependent upon the geometry of the body, its buoyant weight, and the properties of the fluid. The settling velocities of approximately spherical samples, unaltered in composition or texture, were determined using a 7 foot long X 1.1" diameter settling tube filled with sea water obtained from the New London disposal site.

7. Changes in sample volume during settling - Changes in volume of spherically shaped samples were determined during free fall through 30 feet of New London disposal site water. The % erosion, or decrease in volume, is expressed as a percent of the original volume, for selected samples. The percent volume change is generally less than 20 %.

CHEMICAL METHODS

Unless otherwise noted, analyses of solids were determined in accordance with EPA's "methods for chemical analyses of water and wastes" (5).

VOLATILE SOLIDS. Twenty-seven sediment samples representative of each core constituted one run. Duplicate samples were dried overnight at 105 ^{o}C, weighed and placed in a muffle furnace at 600 ^{o}C for 1 hour. After baking, the samples were cooled in a desiccator until samples came to room temperature. Samples were reweighed; the percent difference determined and results averaged, APHA (10).

OIL-GREASE. After compressing and desiccating core samples to remove the excess water, samples were ground, weighed, mixed with ground glass and funneled into extraction thimbles. Soxhlet extractors were used with n-hexane as the solvent. Ten extractions were accomplished at once using a steambath as a heating source. The extractors were run continuously for 6 hours. The hexane was evaporated under vacuum to obtain the residue, the amount of which was determined by weight, APHA (10). The oil-grease determination was time consuming not only in extraction and evaporation time, but in the time required to insure dry sample using only desiccation. Because of these time factors only one determination was made.

COD. Chemical oxygen demand of solid was inferred from the elutriate COD values and based on the weight of the sediment samples. Since

the dump site waters had significant COD values of their own it was assumed the COD contribution due to the solid was equal to the COD for the elutriate less COD for the dump site water alone. In the calculation only the New London elutriates were considered.

HEAVY METALS. Two sets of sediment samples were dried over night at 105 ^{o}C to remove moisture. Each sample was weighed and digested (with heating) in concentrated nitric acid for several hours. After quantitative transfer to polyethylene containers 5 ml of hydroflouric acid was added and left to futher digest over night. Each sample was filtered, washed, and diluted to a volume of 100 ml. All metal analyses subsequently carried out was based on these sample preparations.

Zinc, lead, cadmium and copper were determined by the usual atomic absorption techniques, while mercury was analyzed by the "flameless method" (5).

ELUTRIATE METHODS

Chemical analyses of elutriates were determined according to EPA methods and regulations (2,3,9) and Standard methods APHA (10). Adaptations to several of the standard analytical procedures were necessary in order to compensate for interference of chloride ion.

PREPARATION OF ELUTRIATE. Each core was measured and cut into top, middle and bottom sections. The length of core chosen depended on the amount of core available. Since the elutriate preparation procedure calls for a mixture of one (1) part sediment to four (4) parts dump

site water (by volume) and that two elutriate samples must be prepared for each core section, it was decided to emphasize the top section so that all elutriate analyses could be accomplished at least on those sections of material representative of spoil to be dredged.

Each core section was mixed manually before equal parts were divided for duplicate elutriate tests. The sediment and the dump site water was mixed vigorously for 10 minutes and allowed to settle over night. the clear elutriate was siphoned off and filtered, first with coarse and then with finer filters until the elutriate was passed through .45 micron Millipore R filter. All filters were Millipore R and of the membrane type. The solutions so prepared were cooled prior to shipment to NUSC Newport Lab.

CHEMICAL OXYGEN DEMAND. The great variability of results observed when this factor is determined on seawater samples has been attributed to the fact that a variable amount of chloride ion is converted by the potassium dichromate to chlorine gas in-spite of the precautionary addition of mercuric sulfate which is made in order to complex the chloride ion. To correct for the evolution of chlorine a procedure by Balmann (1) has recently been published which describes the absorption of chlorine in potassium iodide solution from which the chlorine liberates iodine. The latter is then determined by titration with thiosulfate. Thus the extent to which chloride ion is converted to chlorine is immaterial since an accurate determination can be made of the amount of potassium dichromate which has been utilized.

This extension to the COD analysis to samples of marine waters is relatively new, but it appears that it will soon become an acceptable procedure for dealing with the problem of chlorine evolution from saline waters during the COD analysis. Therefore two sets of COD data are presented in the tables. COD represents the apparent COD before correcting for the prescence of chloride ion and COD represents the actual concentration of COD after correcting for chloride interference.

Chemically, the COD determination remains somewhat unsatisfactory since a great many organic substances are resistant to oxidation under prescribed test conditions.

MERCURY. The effect of the evolution of chlorine on the results of the COD test discussed above also has an undesirable effect on the accuracy of the mercury determination according to presently accepted EPA procedures. EPA recommends that a Coleman MSA 50 flameless absorption spectrophotometer be used for the determination of mercury of about 0.15 micrograms per liter or less. Chlorine, however absorbs light in the immediate vicinity (253 nm) of mercury (253.7 nm) and small residues of chlorine have the effect of giving higher than expected values for the concentration of mercury. The problem is easily overcome by preparing the sample the same way as recommended for the use of an MSA 50, but to use instead, an atomic emission instrument whose optics give higher resolution so that traces of chlorine do not interfere. The results given for mercury are based on a single analysis, except for

those of the dumpsite waters which are averages of duplicate results.

LEAD, ZINC, COPPER, CADIMIUM, CHROMIUM. Concentrations for these metals were determined using atomic emission spectroscopy. Analyses were conducted in triplicate and tabulated as averages.

PHENOLS. Phenolics were determined photometrically and only on the top layers of the cores.

DDT. DDT was determined by gas chromatrography.

PCB. PCB, Polychlorinated Biphenyls were also determined by means of gas chromatrography using Aroclors 1242 and 1260 as standards. These standards are mixtures of Polychlorinated Biphenyls and together they span a large number of these compounds. Low values in terms of these standards, as were obtained from these elutriates, give good assurance of the absence of PCB's.

TOTAL PHOSPHORUS and NITRATE. These factors were determined using a Technicon Autoanalyzer.

NITROGEN-KJELDAHL. Total organic nitrogen was determined according to Standard Methods APHA (10).

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APPENDIX I

BEDROCK GEOLOGY OF THE NAVY SUBMARINE BASE

PURPOSE. This investigation was undertaken for the purpose of determining whether the bedrock geology of the Submarine Base, and the basal sediments overlying the bedrock, could support and control the seepage of petroleum products from the fuel storage area (Crystal Lake) into the Thames River pier area.

APPROACH. A literature review was conducted to attempt to consolidate all available data describing bedrock depth and type, and basal sediment type. This data was used to construct a contour chart of bedrock depth and to qualitatively determine the capability of the basal sediments and fractured rock to support flow of a liquid hydrocarbon.

Data was collected with the assistance of Mr. Dominick Gabriel, Submarine Base Engineering Dept., and Mssrs. I. Grossman and P. Haeni of the U.S. Geological Survey, Hartford, CT.

DISCUSSION

GENERAL. Available data (refs 1, 5, 6, 10 and 11) indicate that the bedrock topography is extremely irregular in this general geographic area. Two types of glacial deposits (Pleistocene Age) dominate those found on the Submarine Base:

1. Till (ground moraine) - sediment of heterogeneous size (clay to boulder) and composition deposited beneath the glacier during

glacial advance. 2. Terrace deposits (stratified drift) - largely granular material deposited during glacial retreat by melt water streams.

The dominant bedrock type is Mamacoke Gneiss, of pre-Permian (Mesozoic) Age. It is a metamorphosed igneous rock, comprised chiefly of quartz, feldspar and biotite. It is generally dense and massive but is cut by irregular foliation, cross, and sheeting joints. Within the geographic limits of the Submarine Base it grades laterally north to Alaskite Gneiss and Granitic Gneiss, (ref. 5). The bedrock strikes northwest - southeast at about N 70 W, and the mineral foliation and lenticular compositional layering dip to the north and northeast at angles ranging from 30 to 80 ; the angle of dip appears highest along the south border of the base. Grossman (ref. 12) observed road cuts along Route 12 and determined that joint spacing averaged about three feet. These joints are sub-parallel to the general land surface. Additionally, random local joints and irregular, widely spaced fractures cut the bedrock in a non-persistent manner.

Subsurface conditions are roughly summarized (ref. 1) as follows:

1. Where surface elevations exceed 45 feet bedrock is expected to occur at the surface or beneath a relatively thin layer of till.

2. Where surface elevations lie fairly regular within the 20 through 30 foot range granular stream terrace deposits occur. These deposits are comprised chiefly of sand and gravel.

3. Where surface elevations lie between 25 feet and 50 feet

glacial till is found.

4. Low lying areas contain generally finer grain sediments and peat. These sediments are probably underlain by a thin veneer of ground moraine overlying bedrock.

It should be noted that because of the irregular bedrock topography the appearance of a bedrock outcrop does not necessarily indicate the occurrence of rock at shallow depths adjacent to the outcrop.

CRYSTAL LAKE AREA. The southeast portion of the base is a deeply eroded area which has subsequently been filled by stream terrace deposits and artificial till (refs. 1 and 6). The former Crystal Lake was later filled to provide area for recreational facilities. Depth to bedrock is extremely variable. Bedrock is found within 3 to 6 feet of the surface just west of the central sector of the area. The bedrock plunges to the north, but is found within 5 to 6 feet of the surface near the southern boundary. Rock is also close to the surface at the eastern end of the area. In general the bedrock surface in the southern half of the base slopes irregularly southwestward toward the Thames River estuary.

In the western portion of this area the basal sediments are generally brown to gray, fine to coarse sand with lesser amounts of gravel. The gravel tends to underly the sand and occur directly over the bedrock. The amount of gravel diminishes to the southeast, giving way to increased amounts of fine sand and silt; varved clay and silt

are found in the southeast corner of the base. The gravel content tends to increase laterally toward the east, north and northeast of the central sector of the area. The coarser basal sediments and general downward slope of the bedrock surface toward the southwest indicate that drainage toward the Thames River estuary is quite good.

THAMES RIVER ESTUARY PIER AREA. The bedrock depth in this vicinity, relative to mean low water (MLW) is generally deeper than elsewhere on the base. In the lower base the bedrock slopes westward at an approximate 60% grade and continues at this grade to the seaward end of the piers. The slope then decreases to about a 10% grade to the eastern end of the Thames River channel. The Thames River estuary base is deepest east of the center of the river. The basal sediment is comprised of sand and gravel, with apparent local thicknesses of up to 20 feet. This granular stratum is most evident near the shoreline, where it is usually less than 5 feet thick.

SUBSURFACE GROUND WATER. The water table in the Crystal Lake area is approximately 10 feet. The direction of ground water movement is generally westward, toward the Thames River estuary. The stratified drift is more permeable than till or bedrock, and constitutes the principal aquifer in the region. The abundance of planar joints and of their intersections also facilitate the rapid movement of ground water.

SUBSURFACE MOVEMENT OF PETROLEUM PRODUCTS. An oil pollution study was conducted for the Navy (ref. 7) for the purpose of "determining deficiencies in the diesel and fuel oil systems contributing to pollution". The summary of findings of that study indicate that oil leakage is evident in the Crystal Lake primary fuel storage area. Oily water has been observed in catch basins and culverts in this vicinity and has been observed entering the Thames River; the sources of this oil appear to be surface oil (parking lots, surface seepage, etc.). Also, cracks were observed in the oil pipe lines that run adjacent to the storm drain system into the Thames River estuary (ref. 7). In the southern area of the base the dominant discharge location of the storm drain system into the Thames River appears to occur in the vicinity of Pier 3. An appreciable amount of oil and grease was observed in the top section of the core sample collected from the Pier 3 area. The secondary fuel and oil storage tanks on the lower base and the fueling piers occur in the vicinity of Piers 8 through 12. In all of the core samples collected the highest concentrations of oil and grease occur in the upper and middle sections of core 8N (in the vicinity of pier 8).

CONCLUSIONS

As a result of this brief study the following conclusions are offered:

1. For the Submarine Base in general, the southwestward slope of the

bedrock surface and the granular nature of the Pliestocene basal sediments overlying the bedrock does support water drainage toward and into the Thames River estuary.

2. The water table in the southern area of the base generally resides above the bedrock surface, facilitating seepage along the bedrock surface boundary of water soluble materials and fluids toward and into the estuary.

3. An apparent ridge in the bedrock surface west to west northwest of the Crystal Lake fuel and oil storage area suggests topographic control of seepage direction along the bedrock surface to southward and southwestward courses, and into the vicinity of Goss Cove. Also, tributaries from the storage area empty in to the Cove. A significant portion of the total area drained, consists of parking lots, some not on Navy property. Two public gasoline service stations are also present within the drainage area.

4. Observations of surface seepage of oil in the immediate vicinities of the Crystal Lake oil storage tanks and of the pipe lines to the lower base can be correlated with observations of oily water in the base storm drain system. Petroleum products washed from parking lots during rains also contribute to the observed contaminated water. In the southern sector of the base the dominant storm drain discharge location into the Thames River estuary appears to be in the vicinity of Pier 3. Since relatively high concentrations of oil were found in a sediment sample collected from the Pier 3 vicinity, it appears that

the storm drain system is contributing to the presence of oil in Thames River sediments in the Submarine Base shorefront.

5. The localized high concentrations of oil observed in sediment core samples collected from the vicinity of Piers 8 and 10 suggest that spillage during refueling of vessels has been one of the primary sources of oil in the Thames River estuary, from the Submarine Base.

6. Preliminary analysis of the hydrocarbon constituency in the sediment core samples revealed no distinction between bunker -C fuel oil and diesel oil. The problem lies in the contamination of the hydrocarbon structure from detergents, organic matter, etc. Further refining of the sediment samples is taking place to attempt identification of the source(s) of the observed high oil and grease content.

7. Petroleum products entering into the Thames River estuary from any point source at the Submarine Base will tend to be distributed laterally parallel to shore by North-South flowing tidal currents.

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ANALYSIS OF OIL/GREASE EXTRACTION RESIDUES. As part of the Thames River Dredge Spoils Project hexane extractions of dry sediment samples were performed. The residues (oil-grease) left after the evaporation of the n-hexane ranged in value from 140 to 13000 ppm (values corrected for hexane blank). Since oil-grease values above several thousand ppm are considered high, an effort was made to determine whether the residues found in the sediments could be traced to their source. In this case, several possible hydrocarbon sources existed because of the close proximity of the samples to fueling and storage facilities associated with the Groton Sub Base.

METHOD OF ANALYSIS. Gas chromatography was employed as a means of comparing components of the oil-grease residues with various hydrocarbon fuels and in common use on the Base. Gas chromatography has sucessfully been used in tracing oil spills to their source. Separation of the components present in any volatile mixture is achieved by a column packed with an inert support and liquid phase over which the vapors of the sample pass.

Three columns were used for our analysis, they were: Dexsil 300, FFAP, and Apiezon L. Temperature programming and the "boat" sampling technique were used for most of the samples.

RESULTS. Chromatograms for no. 2 and no. 6 fuels were produced. These showed a large number of peaks characteristic of the many resolvable components present. The hexane extracted residues

chromatographed similarly did not yield patterns common to the fuels. The residues were difficult to chromatograph. At a temperature range of 225 to 250 1/4C, one large unresolved peak resulted, yet the sample was not completely volatilized. At higher temperatures decomposition apparently occurred leaving an ash in the "boat". In this case low temperature peaks occurred, which were probably related to decomposition products.

DISCUSSION. We feel that there are many organic compounds present in the residue that are not oil related. These compounds belong to the fats and soaps catagory and are a variety of fatty acids and esters. We do see the presence of hydorcarbons (our recurring unresolved peak) but it does not compare well to our fresh fuel chromatograms. Older oils lose their lighter components, this results in a loss of parafins which yields heavy aromatic and branched compounds. The residues are more concentrated in the fueling dock and drain areas suggesting a correlation with hydrocarbons. We intend to continue this work by trying a separation technique prior to analysis by gas chromatography. The residue will be saponified to get rid of fatty acids then extracted in a non-polar solvent. The hydrocarbon should then be free of interfering substances and should be more easily chromatographed.

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APPENDIX J

LEAD ANALYSES OF DISPOSAL SITE WATERS

Considerable controversy surrounds the existing state-of-the-art for lead analyses in sea water samples. The most reliable method for analyzing lead in sea water samples is Stable Isotope Dilution. The sophistication as well as accuracy of the procedure is well documented but is uneconomical and time consuming in terms of standard laboratory technique. At best, the procedure provides a means of standardization for lead in sea water samples. Using this method of standardization, an interlaboratory study (1) of lead analyses was conducted on sea water collected from West Coast waters. Replicate samples were standarized using the isotope dilution technique and sent to reputable laboratories throughout the United States. Such methods as atomic absorption, anodic stripping voltammetry, pulse polarography were used and compared to the standards, the standards ranging anywhere from 14 to 80 nanograms/Kg. The results of the test as submitted from participating laboratories were different by orders of magnitude as compared to the standard. The study indicated that the lack of comparison and extreme error experienced by the participants were due largely to contamination of samples during sampling and laboratory work-up.

A report on the Fates of Heavy Metal Wastes in Long Island Sound (2) implied that measurements for lead were inaccurate and therefore excluded from the report. Conversations with one of the authors of this report indicated that a sample had been collected at the New London Dumping Ground during March 1975 and analyzed using the isotope dilution

technique. The sample was observed to contain 140 nanograms of lead per liter. The primary source of this lead was attributed to auto emmissions.

On May 21-23, 1975 sea water samples collected from the New London Dumping Ground and "East Hole" in support of the project elutriate analyses indicated lead in excess of 600 ppb, many times higher than values observed in coastal waters. These results were determined by atomic emission spectroscopy by Naval Underwater Systems Center (NUSC) personnel at Newport, R.I.. A paper by Portmann (4) reports the main sources of lead to be lead sulfide (PbS) and lead carbonate (PbCO). These species are relatively insoluable and concentrations can be found in sea water as high as 9.0 ppb. The report also stated that the solubility of lead salts approached 100 ppb at which point it precipitates in sea water. In addition, Manahan (3) reports that a survey for lead in natural waters has shown that this factor has never been observed in excess of 140 ppb. Consultations with scientists at the National Marine Fisheries Service expressed doubt that lead would exist in sea waters at the levels reported.

In August and September of 1975 additional samples were collected to evaluate the concentrations of lead. Sampling procedures as well as analytical techniques were investigated to determine the source or sources of error. In addition, samples were split and sent to NUSC, Newport, R.I. and the Naval Oceanographic Laboratories (NAVOCEANO) in Washington, DC. Using atomic emission NUSC again observed high values

for lead in the dump site waters (450 ppb). NAVOCEANO, using atomic absorption, reported 20 ppb lead from a composite of the same samples.

On October 9, 1975 a meeting was held at Northern Division, Naval Facilities Engineering Command, Philadelphia, Pa. to determine the reliability of lead data reported by both NUSC and NAVOCEANO personnel. Representatives from Northern Division, NUSC - New London, CT./Newport, R.I., NAVOCEANO, and the National Marine Fisheries Service were in attendance. After discussing at length, the reliability of previously analyzed lead data, the participants offered the following conclusions:

1. The previous samplings taken in August and September of 1975 and the subsequent analysis as conducted by NUSC and NAVOCEANO left a number of questions unanswered concerning analytical methods.

2. Although the concentrations of lead reported for both the "East Hole" and the New London Dumping Ground were essentially the same, they were six times greater than the solubility limit (100 ppb) for lead in seawater. Since a point source discharge for lead would be subjected to considerable tidal action and dilution by seawater over the distance separating the disposal sites, point sources of contamination were eliminated as possibilities.

3. On the basis of experiments conducted at NUSC, Newport R.I., it was proposed that the elevated lead concentrations as observed in Long Island and Block Island Sounds may be a 'background' reading due to organically bound lead in seawater, and may in fact, be a coastal or seasonal phenomena not previously detected.

4. It was also agreed, that a sampling and analytical study be designed to prove the reliability of the analytical methods and to determine if lead does exist at the reported levels in an organically bound fraction of seawater.

Following the recommendations of the meeting, additional samples were collected on October 22, 1975. The samples were collected and prepared according to recommended procedures and analyzed by both NUSC, NewPort, RI. and the NMFS at the Sandy Hook Laboratory, Highlands, New Jersey. Sampling stations are presented in Figure I and the results of the analyses are presented in Table I.

It should be noted that there is general agreement in the lead values detected by both of the participating laboratories, and that the lead values detected on October 22, 1975 were more than twice the values reported in the literature for lead in seawater. In addition, the different analytical methods employed suggest that the previously observed lead values may be valid. As a result of this study, there are yet two questions that remain to be answered:

(1) Were the high lead values previously observed a coastal and/or seasonal penomenon not previously detected?

(2) Were the high values observed a result of sample contamination?

Although a definitive explanation can not be offered at this time, and there is sufficient evidence in the literature to preclude the existance of lead in an aqueous environment at the levels reported, provisions

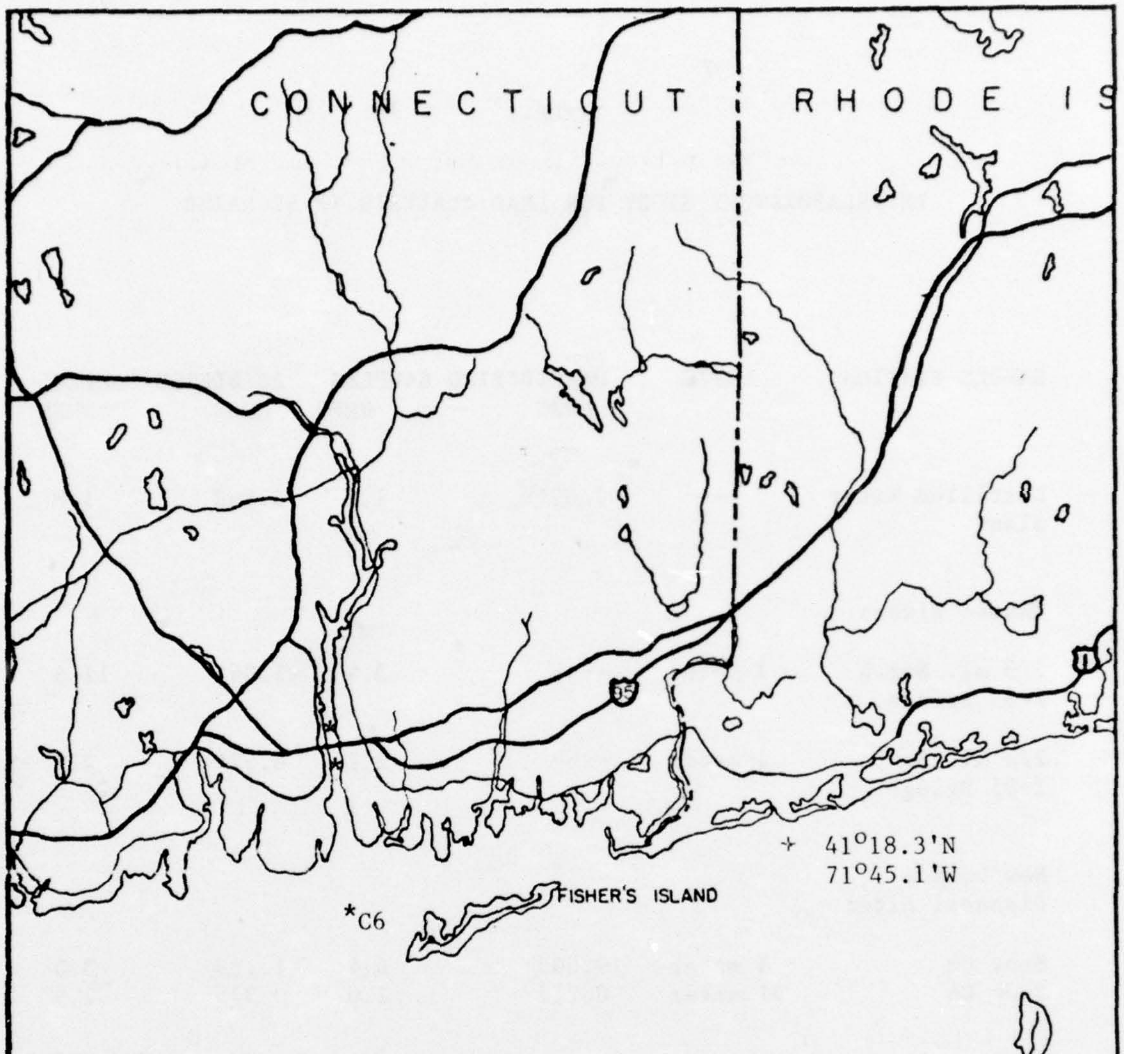

CONNECTICUT
RHODE IS
41°18.3'N
71°45.1'W
FISHER'S ISLAND
*C6
41°09.0'N
71°21.4'W
BLOCK ISLAND
LONG ISLAND
0 5 10 15
GRAPHIC SCALE IN MILES
N
SAMPLES COLLECTED
INTERLABORATORY LEAD STUDY
*NMFS October 22, 1975
+NUSC November 12, 1975

FIGURE I

TABLE I

INTERLABORATORY STUDY FOR LEAD ANALYSIS IN SEAWATER

SAMPLE STATION	DEPTH	UNACIDIFIED SAMPLES NUSC	UNACIDIFIED SAMPLES NMFS	ACIDIFIED SAMPLES NUSC	ACIDIFIED SAMPLES NMFS
Distilled Water Blank.	----	1.021	1.2	3.662	1.8
Thames River:					
2/3 mi. North I-95 Bridge.	1 meter	----	3.9	1.041	11.5
2/3 mi. South I-95 Bridge.	1 meter	----	2.1	8.524	2.3
New London Disposal Site:					
Buoy C6	1 meter	0.605	6.4	1.139	3.0
Buoy C6	31 meter	0.715	2.0	0.375	2.9
Rocky Point*	1 meter	0.505	1.31	0.426	2.05
Weekapaug*	1 meter	2.221	1.53	0.281	1.73

*Collected November 24, 1975.

Note: A sediment grab sample collected on November 24, 1975, at the New London Disposal Site detected lead at a concentration between 5 and 20 ppm dry weight.

SAMPLES ANALYZED BY PULSED ANODIC STRIPPING VOLTAMMETRY

are being made to incorporate the lead analysis of disposal site waters into the on-going monitoring program.

The attached letters and memos represent the opinions of the participating laboratories and/or investigators.

LITERATURE CITED

1. Brewer, P. and Frew, N. et al. Interlaboratory Lead Analyses of Standardized Samples of Seawater. TUR Marine Chemistry, 1974.

2. Delinger, P., Fitzgerald, D. F. et al. Investigations on Concentrations, Distributions, and Fates of Heavy Metal Wastes in Parts of Long Island Sound. Marine Sciences Institute, University of Connecticut, 1974.

3. Manahan, S. E. Environmental Chemistry. Willard Grant Press, Boston, Massachusetts, 1972

4. Portmann, J. E. Possible Dangers of Marine Pollution as a Result of Mining Operations for Metal Ores. Marine Pollution and Sea Life, 1972

Memo to Ta130
Encl(1) Page 1

SB322:HPH:hph
9 Dec 75

DISCUSSION OF THE ANALYTICAL RESULTS OBTAINED FOR LEAD IN CONNECTION WITH THE THAMES RIVER DREDGING PROJECT IN 1975.

Between June 1975 and December 1975 the chemistry laboratory at NUSC,NPT analyzed a large number of seawater samples for their lead content.These samples were either dumpsite waters, dredge core elutriates or special samples that had been received as part of the Phase I and Phase II effort in trace metal analysis for the Thames River Dredging project. The results are shown in Table I,II and III.

A choice of analytical methods was available, there being on handboth an electrochemistry system which does differential pulsed anodic stripping voltammetry(DPASV) and an atomic emission(AE) spectro meter with an Argon plasma source. The latter method is very rapid. Results can be obtained without any pretreatment of seawater samples. They are injected directly into the plasma. The method gives excellent results as long as the concentration of lead is not lower than about 65 ppb. Below that concentration and into the parts per trillion range anodic stripping voltammetry is well suited for the analysis of seawater samples if certain precautions are taken which are discussed later.

During the Phase I analyses concentrations of lead were observed in the elutriates and in the dumpsite waters which are abnormally high. They were in the neighborhood of 500 ppb(0.5 ppm or 0.5 mg/liter). There was naturally some variation in the results, but generally the elutriates tended to be lower in lead than the dumpsite waters. But in the few instances in which the elutriates were higher in lead none contained more then 1.5 times the amount of lead in the dumpsite water with which it had been prepared.

The amounts of lead reported during phase I were, however, so very much higher than those mentioned in the literature for typical ocean water samples(about 0.5 ppb) that a concerted effort was made to find out why these results might be high.

The method of collecting the sample by pumping it into a container was examined first. The pump used for Phase I collections was made entirely of plastic except for one small metal washer. The latter, however, was made of stainless steel and moreover showed no evidence of corrosion.

It was then decided to run a check on the results obtained by atomic emission by having NAVOCEANO and NUSC,NPT analyze identical samples but with different methods. NAVOCEANO used atomic absorption spectroscopy and reported 29 ppb of lead in a sample in which NUSC using atomic emission had found more than 300 ppb. This was obviously a very serious discrepancy. Atomic emission had, however, been found to produce a signal which varies linearly with the concentration of lead in seawater without any pretreatment of the sample, and the instrument had been calibrated many times. Therefore the procedure to which the sample was subjected before analysis by atomic absorption(AA) was examined in detail. This led to the discovery that in the step in which lead is concentrated by absorbing it on a resin column most of the lead was actually not absorbed, because it can be in the form of a complex which is not easily dissociated as was the case in that sample. Such complexes are known to exist between inorganic ions and tannins or humic acids. These complexes can be broken up by acidifying the sample for some time to a low pH. Thus a sample of seawater which without pretreatment with acid had been shown to contain 400 ppb of lead by atomic emission appeared to contain only 0.4 ppb of lead when analyzed by DPASV. The latter method also requires lead be present only in the ionic form. But the same sample after it had been acidified first and then analyzed(DPASV) after its original pH had been reestablished also showed 400 ppb of lead.

Up to now lead in seawater has been a difficult element to determine and discrepancies in the results obtained by different laboratories have been reported in the literature such as in the journal Marine Chemistry in 1974. The unrecognized presence of complexes of lead with natural products may have been part of the problem.

While the observations on the importance of first destroying a complex which may make lead unavailable for analysis by certain methods explained satisfactorily the initial discrepancy between the results obtained by NAVOCEANO and those obtained by NUSC they did not account for the large absolute values of lead obtained in PhaseI. It would be easy to attribute them to lead getting into the samples in some way or other during the collection process, but none of the materials with which the samples were reported to have come into contact contained any lead.

During Phase II the elutriates contained only one third of the amount of lead observed previously. All seawater samples were again analyzed with atomic emission. A different pump had been used this time to collect the dumpsite waters. It was found, however, that when distilled water was circulated through the pump for some time it contained 35 ppb of lead.(The latter determination was made with AE.) The pump thus may have contributed an unknown amount of lead to the lead in the dumpsite waters. Apart from that fact it is, however, remarkable that the elutriates generally contained only about half as much lead as the dumpsite waters from which they had been prepared. This phenomenon has been observed before with zinc although with smaller absolute amounts. Shaking up a sediment with seawater can also decrease the amounts of a metal in the elutriate.

An attempt was then made to firm up the the observation which NUSC had made about the importance of acidifying the samples for some time before submitting them to atomic absorption/diff.pulsed anodic stripping voltammetry by having National Marine Fisheries and NUSC analyze samples from seven different locations for lead by means of anodic stripping voltammetry. Table II shows the results obtained. Half of the samples were treated with acid and half of each was then filtered through 0.45 micron Millipore membranes. Twenty-eight samples were analyzed. The method of standard additions was used but no replications were made. The cross relation between the coded samples is presently unknown to NUSC. Some of the coded samples,however, seem to contain about ten times as much lead as is supposed to be present in seawater. In some cases filtering made an appreciable difference in others it did not.Even the largest amounts observed were still ten times less than that observed in the elutriates of Phase II although the values for the latter are probably high. In two cases, on neutral samples the method of standard addition did not give useable results. Without knowing the correspondence between the sample numbers it is difficult to say whether acidification made any difference. If it did not it would not invalidate the observations about its importance. It may simply mean that there were no complex forming moieties present at these locations at that time.

TABLE I

THAMES RIVER ELUTRIATE WATER SAMPLES, PHASE I., MAY, 1975

SAMPLE STATION	LEAD (ppb)
EH BASELINE	564
NL BASELINE	655
3S TOP EH	460
10S TOP EH	473
8N TOP EH	551
8N MID EH	506
8N BOT EH	513
8N TOP NL	557
8N MID NL	555
8N BOT NL	536
10N TOP EH	543
10N MID EH	505
10N BOT EH	499
10N TOP NL	568
10N MID NL	571
10N BOT NL	663
14N TOP EH	534
14N MID EH	539
14N BOT EH	497
14N TOP NL	534
14N MID NL	558
14N BOT NL	551
17S TOP EH	556
17S MID EH	566
17S BOT EH	530
17S TOP NL	525
17S MID NL	562
17S BOT NL	561

TABLE I (CONTINUED).

SAMPLE STATION	LEAD (ppb)
31N TOP EH	518
31N MID EH	554
31N BOT EH	537
31N TOP NL	558
31N MID NL	545
31N BOT NL	558
32N TOP EH	579
32N MID EH	579
32N BOT EH	548
32N TOP NL	909
32N MID NL	812
32N BOT NL	690
CH-1 TOP EH	527
CH-1 MID EH	517
CH-1 BOT EH	539
CH-1 TOP NL	711
CH-1 MID NL	692
CH-1 BOT NL	597
CH-2 TOP EH	518
CH-2 MID EH	498
CH-2 BOT EH	488
CH-2 TOP NL	561
CH-2 MID NL	549
CH-2 BOT NL	488

SAMPLES ANALYZED BY ATOMIC EMISSION SPECTROSCOPY

TABLE II

THAMES RIVER ELUTRIATE WATER SAMPLES, PHASE II., SUMMER 1975

SAMPLE STATION	LEAD (ppb)
EH BASELINE	332
NL BASELINE	373
1 TOP EH	158
1 MID EH	164
1 TOP NL	182
1 MID NL	181
2 TOP EH	161
2 MID EH	148
2 TOP NL	180
2 MID NL	177
3 TOP EH	161
3 MID EH	148
3 TOP NL	180
3 MID NL	174
4 TOP EH	146
4 MID EH	153
4 TOP NL	184
4 MID NL	177
5 TOP EH	169
5 MID EH	168
5 TOP NL	174
5 MID NL	187
6 TOP EH	167
6 MID EH	162
6 TOP NL	186
6 MID NL	203
7 TOP EH	156
7 MID EH	164
7 TOP NL	172
7 TOP NL	159

SAMPLES ANALYZED BY ATOMIC EMISSION SPECTROSCOPY

TABLE III

SAMPLE #	ACIDIFIED SAMPLES	
	UNFILTERED	FILTERED
1020	8.524	7.373
112	0.375	1.478
10	3.662	5.918
13	1.139	0.690
010	1.041	1.289
Rocky Point	0.426	0.538
Weekapaug	0.281	10.667
	NEUTRAL SAMPLES	
	UNFILTERED	FILTERED
14	--	1.287
17	1.021	1.076
474		0.852
864	0.605	1.014
118	0.715	0.684
Rocky Point	0.505	3.279
Weekapaug	2.221	5.938

SAMPLES ANALYZED BY PULSED ANODIC STRIPPING VOLTAMMETRY

Conclusions:

1. There is no doubt that the results reported by NUSC,NPT for lead in seawater are correct as far as the analyses themselves are concerned. As a result of this work the analytical chemistry of lead in seawater is now more firmly in hand.

2. Complex formation of lead with substances in seawater has been shown to exist and may give low results for lead if the complex is not destroyed before proceeding with atomic absorption spectrophotometry or differential pulsed anodic stripping voltammetry.

3. Some of the lead may have been inadvertently introduced into the samples during the collection procedure of Phase II, but seasonal fluctuation may occur anyway if there is a seasonal fluctuation of the complexing agent in the seawater. Humic acids are such agents and since they are decomposition products they are present more abundantly in the summer than in the winter.

4. *It is highly desirable that the possibility of the existence of* a seasonal variation in lead content be examined and its extent be determined. It may be a phenomenon which is in part or wholly responsible for some of the high lead values observed.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

November 24, 1975

Mr. James McKinney
Department of the Navy, Code 114
Northern Division
Naval Facilities Engineering Command
Building 77, U.S. Naval Base
Philadelphia, Pennsylvania 19112

Dear Mr. McKinney:

Enclosed is a chart on which I have labeled the three locations at which I collected samples on 22 October 1975. They were taken in a General Oceanics Niskin Bottle adapted by our Laboratory to minimize sample contamination by heavy metals. The adaptations include replacing the closure band and the "O"-rings with material shown to be free of leached metal even over long periods.

Two casts were made at each sampling depth or site. The first was used to rinse the remainder of the distilled water from the acid cleaned sample bottles supplied by Ruth Waldhauer. The second was used to fill all four bottles. Two of these were frozen and to two I added 500 μl of HNO_3. We began sampling at the bottom of C6 in the dump site at about 1430 and finished the last sample above the bridge at about 1530. The location of each sample follows:

STATION	DEPTH	FROZEN		ACIDIFIED	
C6	31 meters	118	486	112	877
C6	1 meter	864	863	13	879
Buoys 11 and 12 (2/3 mi. S. I95 Bridge)	1 meter	14	855	1020	42
Buoys 4 and 5 (2/3 mi. N. I95 Bridge)	1 meter	474	937	010	902
Blank, distilled water		17	35	10	9

Sincerely,

Andrew Draxler

Andrew Draxler
Chemist

Encl:

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

November 24, 1975

Mr. James McKinney
Department of the Navy, Code 114
Northern Division
Naval Facilities Engineering Command
Building 77, U.S. Naval Base
Philadelphia, Pennsylvania 19112

Dear Mr. McKinney:

Enclosed are our results from the cooperative lead analysis of five sea water samples from the New London, Connecticut, area. The two additional samples supplied by Dr. Jones are now being analyzed and this data will be sent to you as soon as possible. In those samples which were acidified, most of the organic binding would be disrupted, releasing the lead so held. Thus we find no support for previously reported values for lead of several hundred ppb in samples from the New London area.

The sample codes corresponding to sampling sites will be sent, under separate cover, to you by Mr. Draxler. In an additional attempt to preserve the independence of the study, neither I nor the two chemists who performed the analytical tests, have had access to that information.

SAMPLE NUMBER	LEAD, ppb
35	1.2 ± .07 *
937	3.9 ± .57
863	6.4 ± .03
855	2.1 ± .17
486	2.0 ± .34
✗ 9	1.8 ± .05
✗ 902	11.5 ± .05
✗ 879	3.0 ± .51
✗ 42	2.3 ± .09
✗ 877	2.9 ± .03

*mean ± average deviation

Sincerely,

Robert K Tucker

Robert K. Tucker, Chief
Biochemical Modeling Investigation

VIA TELECOPY

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

December 12, 1975

Mr. James M. McKinney
Department of the Navy, Code 114
Northern Division
Naval Facilities Engineering Command
Building 77, U.S. Naval Base
Philadelphia, Pennsylvania 19112

Dear Mr. McKinney:

These are the two additional sample points to complete values we sent in the letter of 24 November 1975.

SAMPLE	Pb, ppb
Rocky Point	
soluble fraction	1.31 ± .17 *
acidified fraction	2.05 ± .15
Weekapang	
soluble fraction	1.53 ± .21
acidified fraction	1.73 ± .18

*mean ± average deviation

Sincerely,

Robert K Tucker

Robert K. Tucker, Chief
Biochemical Modeling Investigation

APPENDIX K

U.S. NAVY / U.S. COAST GUARD BATYYMETRIC SURVEY
OF THE NEW LONDON DUMPING GROUNDS
AUGUST 13, 1975

PURPOSE. Determine the volume of dredge spoil material remaining in the dumpsite relative to the estimated volume of material dredged. Consequently, determine whether spoil material is being scoured and transported out of the authorized dump site area. Utilize results to assist in deciding future use of the dump site.

APPROACH. Conduct a multifrequency acoustic bottom profiling survey of the dumpsite area. Determine the pre-dump and post-dump bottom profiles, and corresponding residual spoil pile thickness.

INTRODUCTION. One criteria for permitting the Navy's Thames River dredge spoils to be dumped at the New London dump site was that the material would remain on site (containment dumping). Therefore, monitoring of spoil retention or transport is necessary. The New London dump site is one mile square, and is located about 1 1/2 miles south of the Connecticut shoreline and 2 miles west of Fishers Island, N.Y. The water depth at the site is generally 60 to 70 feet deep.

A joint survey team, consisting of representatives from the Naval Underwater Systems Center (NUSC), and Navy Facilities Engineering Command, Northern Division, (NAVFAC NORDIV), United States Coast Guard Academy (USCGA) and the USCG Research and Development Center, was assembled to undertake this cooperative investigation on 13 August 1975. The survey vessel, a modified T-boat, and a two frequency acoustic fathometer were provided by the Coast Guard Academy. A towed side scan sonar system was

provided by the USCGA R & D Center. A Decca navigation system, underwater television camera system and diving services were provided by NUSC. This effort was undertaken as an attempt to validate the results of a USCGA student exercise in September 1974 to calculate the volume of spoil material dumped from profiling records obtained using a two frequency bottom profiling system. The calculated volume of spoil material retained at the dump site was determined to be within 98% of the estimated volume of material dredged from the Thames River, ref. 1. However, it was suspected that the degree of error could be large due to the relative lack of navigation accuracy imposed by the time required to shoot visible fixes while underway.

DISCUSSION

A. Equipment

1. Two frequency bottom profiling system.

The primary system used for this exercise was a Raytheon portable bottom survey system, model RTT-1000 (a), figure 1. This model is a dual function system designed for shallow water bathymetric and sub-bottom profiling. A high frequency (200 kHz) transducer and transceiver component provide precise depth determination of the water-sediment interface. Simultaneously, bottom penetration is achieved using a low frequency transducer (7kHz) and compatible transceiver. The dual transducer array is ridgidly mounted port side aft of the vessel. Sounding results are displayed onboard ship on a dry paper recorder, with a one foot height resolution capability. The general specifications

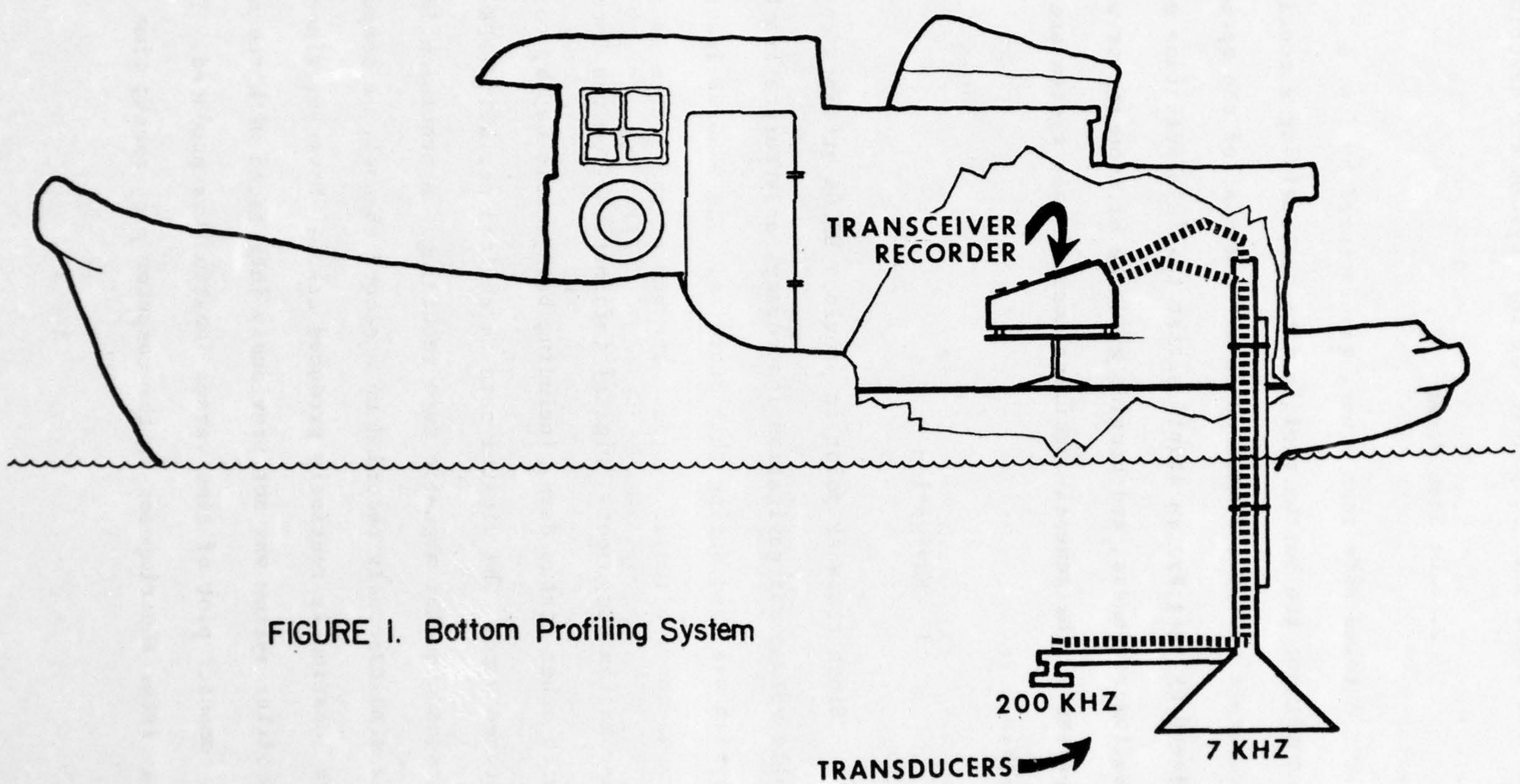


FIGURE I. Bottom Profiling System

of the three main components of this system are described in Table 1.

2. Side Scan Sonar

A towed side scan sonar, manufactured by E.G. & G., was utilized to compliment the bottom profile data by providing a continous lateral coverage of the sediment surface. A moziac of the optical imagery produced by this system should assist the interpretation of small scale bottom roughness, and provide evidence of scouring or winnowing, if present. The general specifications of this system are summarized in Table 2.

3. Navigation

Since the weak point in previous USCGA attempts to calculate spoil pile volume was navigation inaccuracy, an accurate tracking navigation system was used during this exercise. The NUSC RF Tracking System is a range-range circular system. The hub of the system is a Decca (Del Norte) navigation component. Digital information from the Decca unit is stored with other status data, including bathymetric depth, to produce a 96 byte stored word. The digital data is shifted serially (FSK) to produce analog frequencies for magnetic tape recording. A precision IRIG-B time signal is simultaneously recorded on a second channel. A computer plot of depth vs location is routinely produced ashore, however, since this 2 frequency profiler system was not previously interfaced with the navigation system a computer plot of time versus location was produced. The profiling data was later superimposed on the computer plot sheet; time notations at a

TABLE 1: SPECIFICATIONS FOR THE RTT-1000(A) BOTTOM PROFILING SYSTEM

Model TC-7 Transducer	Model PTR-106 Sound Transceiver	Model DE-719-RTT Survey Rathometer
Material: *lead zirconate titanate*	Power output: 2000 watts max.	Accuracy: 0.5% + 1" of depth
Input Power: 2000 watts maximum pulse at 1 ms.	Frequency: 7kHz, standard PTR	Voltage Input: 12 VDC or 115VAC, with optional power supply
Frequency: 7 kHz	Voltage Input: 115VAC or 12VDC, with optional inverter	Electronics: Solid state
Bandwidth: 2.6 kHz	Pulse width: 0.1 ms - 1.0 ms	Chart Paper: 7" x 60'
Beamwidth: 36^{o}	Electronics: All solid state	Calibration: feet or meters
Dimensions: 17" dia. x 8" high	Dimensions: 19" x 17" x 6¼"	Operating Frequency: 7 kHz and/or 200 kHz
Weight: 36 lbs.	Weight: 55 lbs.	Dimensions: 18" x 15 3/8" x 9 1/16"
Cable Length: 50 ft.		Weight: 47 lbs.

one second interval were provided on the plot sheet. Table 3 summarizes the general specifications of this system.

TABLE 2: SPECIFICATIONS FOR THE SIDE SCAN SONAR SYSTEM

Manufacturer:	E G & G
Frequency:	105kHz
Depth:	Variable about 25 ft.
Cable Length:	40 meters (131 ft.)
Recorder:	E G & G model 259-3

TABLE 3: SPECIFICATIONS FOR THE NUSC RF TRACKING NAVIGATION SYSTEM

Range Limit: 15 miles

Resolution: $\pm$ 2 meters

Linearity: $\pm$ 3 meters

NUSC FSK modulator and controller

DECCA (DEL NORTE) Transceiver & digital electronics

Time Code Generator: Datum, Model 9150

Magnetic Tape Recorder (Analog): Sony, Model TC-353D

B. Analytical Procedures

1. Bottom Profiling.

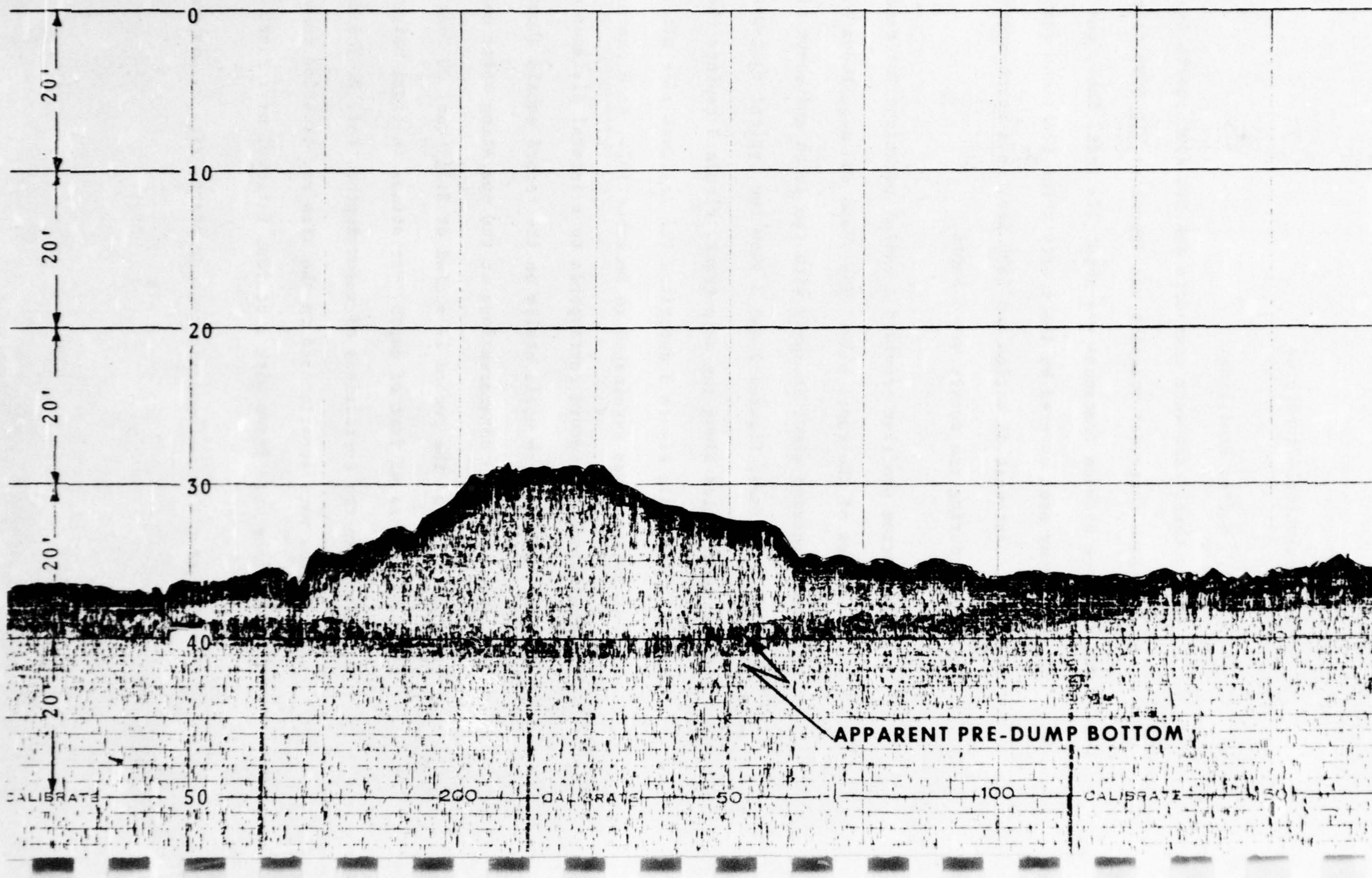
Twenty three east-west transects and two south-north transects were run. Each east-west transect was approximately 4000 feet long. The distance between transects was about 171 feet. Thus, the dimensions of the survey area covered by the twenty three transects was 4000 feet in an east-west direction and 3600 feet in a north-south direction. Ship speed during the survey was 5 knots.

The bottom profiler provided a useful technique for recording the thickness of the spoil piles. The shape and magnitudes of the pile were recorded simultaneously with the depth and shape of the pre-dump interface. Figures 2 and 3 show two typical east-west profiles of the spoil piles along the ship track. Figure 2 depicts the more recent pile, while Figure 3 describes the residual pile after dumping at that location was terminated in December 1974. Each one minute interval along the record corresponds to a lateral distance of about 507 feet, or one inch horizontally on the record equals about 254 feet. For the depth determinations at the operating water depths the vertical scale on the record is scaled at 2:1; thus, 20 feet on the chart is read as 40 feet of depth. Variations in tidal heights were considered in the corrections of water depths, ref. 2. The corrected water depths were superimposed on the *time vs. location* computer plot. Contour lines were drawn with a contour interval of 2 feet.

The resulting bathymetric contour chart, Fig. 4, was compared with

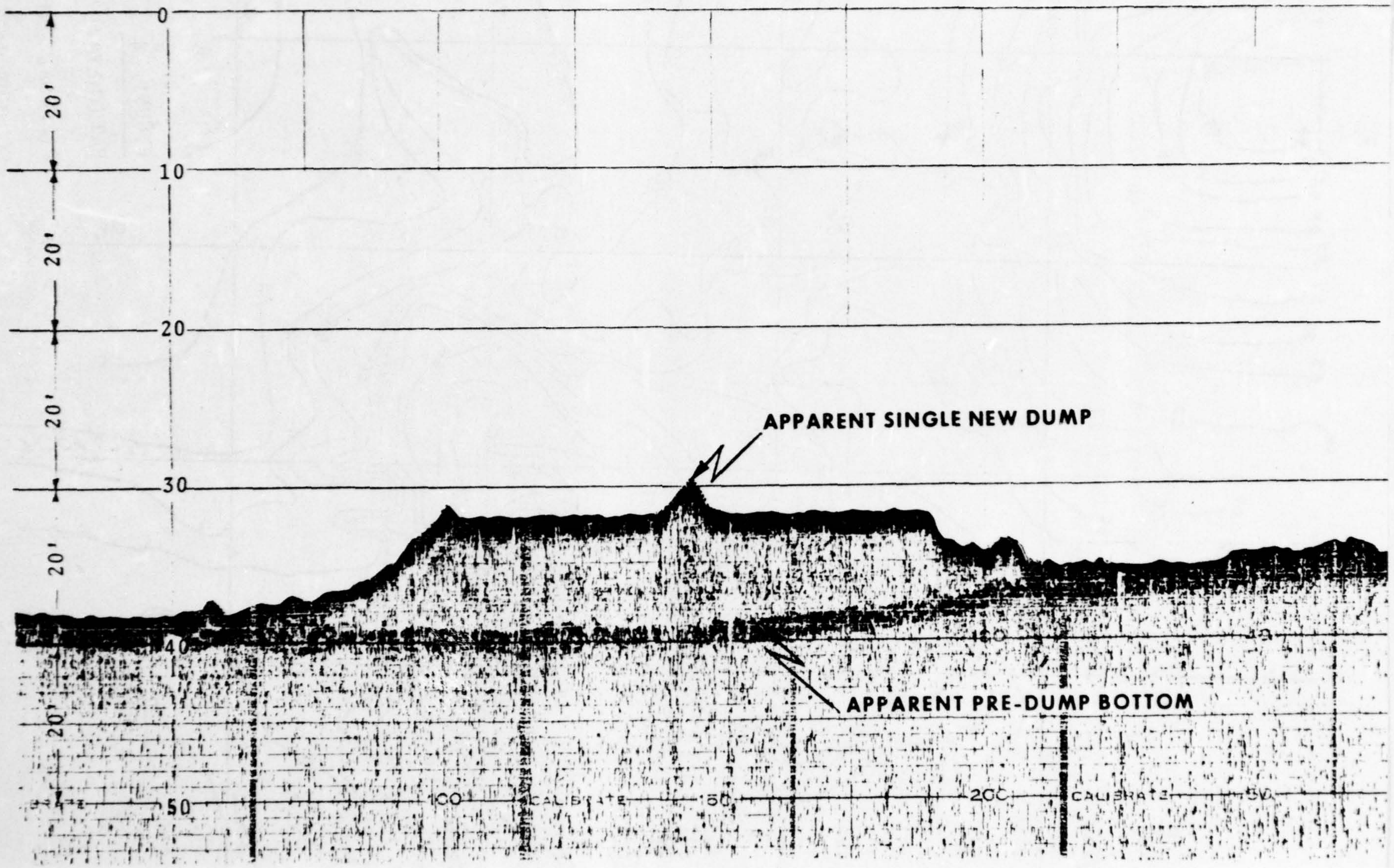
BOTTOM PROFILING RECORD - DREDGE SPOIL PILE

Figure 2



BOTTOM PROFILING RECORD - DREDGE SPOIL PILE

Figure 3



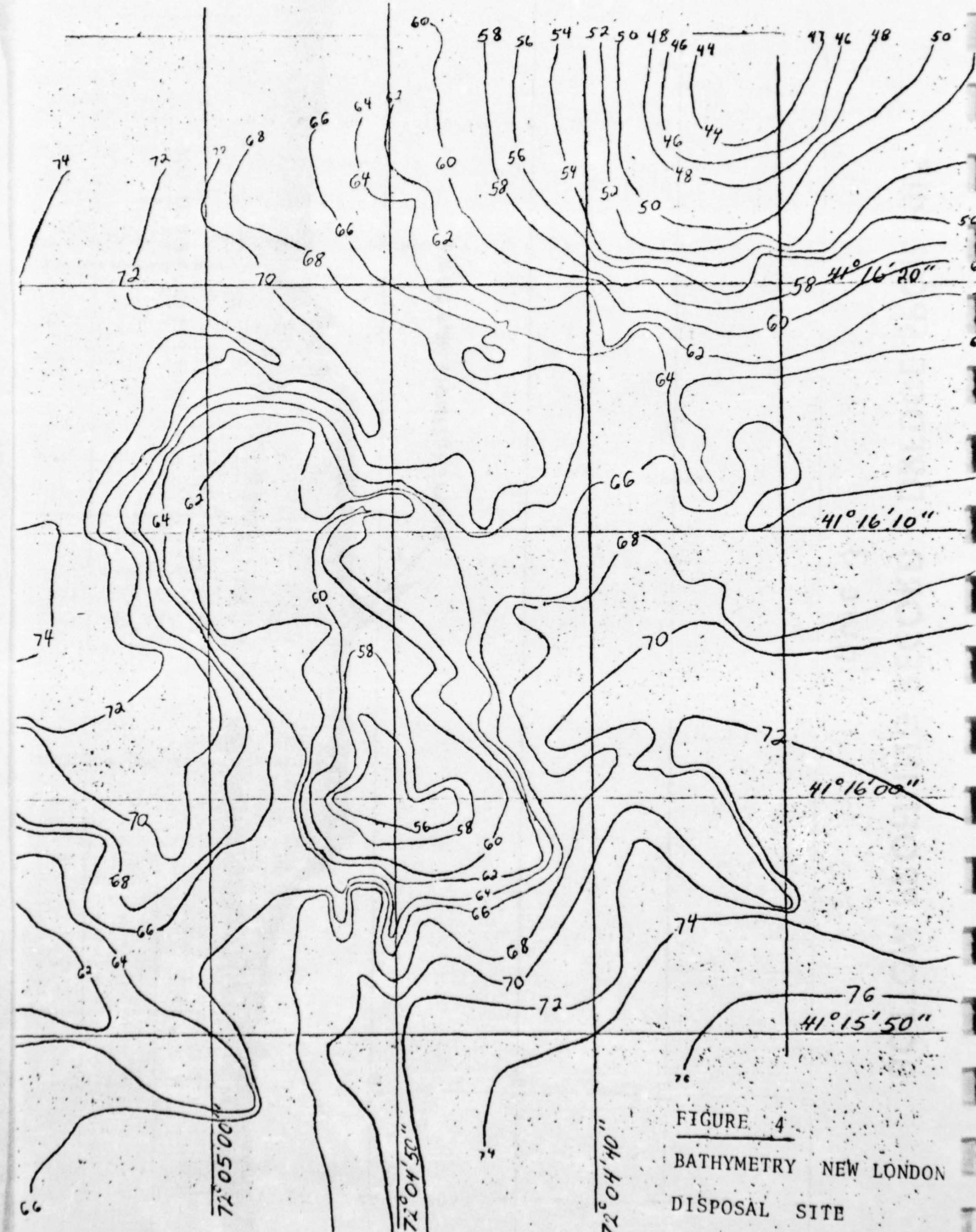


FIGURE 4

BATHYMETRY NEW LONDON DISPOSAL SITE

CONTOUR INTERVAL=2'

a similar chart Fig. 5 constructed from results of a survey in February 1975 (ref. 3). The effects of designating a new dump area south-east of the marker buoy is clearly shown in the comparison of the two charts. The February chart indicates a broad flat elevated feature between 41°16'00"N and 41°16'15"N and 72°04'50"W and 72°05'05"W. The chart resulting from this investigation reveals a more recent accumulation atop of the flat elevated feature, and centered about 41°16'00"N and 72°04'50"W. This latter chart reveals a portion of the former area to the north west.

Prior to the calculation of spoil volume remaining at the dumpsite it was decided to determine whether a residual cover of spoil material, from the Navy's preliminary dredging of 92,500 yds from the Thames River, could be determined and whether it would influence the calculations. This consideration also arose since a relatively thin, approximately 2 to 4 feet thick, surface sediment layer was observed in the profiler record to occur laterally adjacent to the primary spoil pile. A dredge spoil thickness map was constructed, Fig. 6, by comparing two bathymetric charts, constructed by NAVOCEANO, ref. 5, from pre-dump and post-dump surveys. These NAVOCEANO charts are presented as Figures 7 and 8, respectively. The thickness chart, Figure 6, revealed spoil thickness of about two feet over much of the dumpsite. Local thicknesses of up to about six feet were observed in the north-central sector of the dump site. No apparent accumulations were observed in the southern sector of the dump site.

In the recent investigation a spoil thickness isopach contour map,

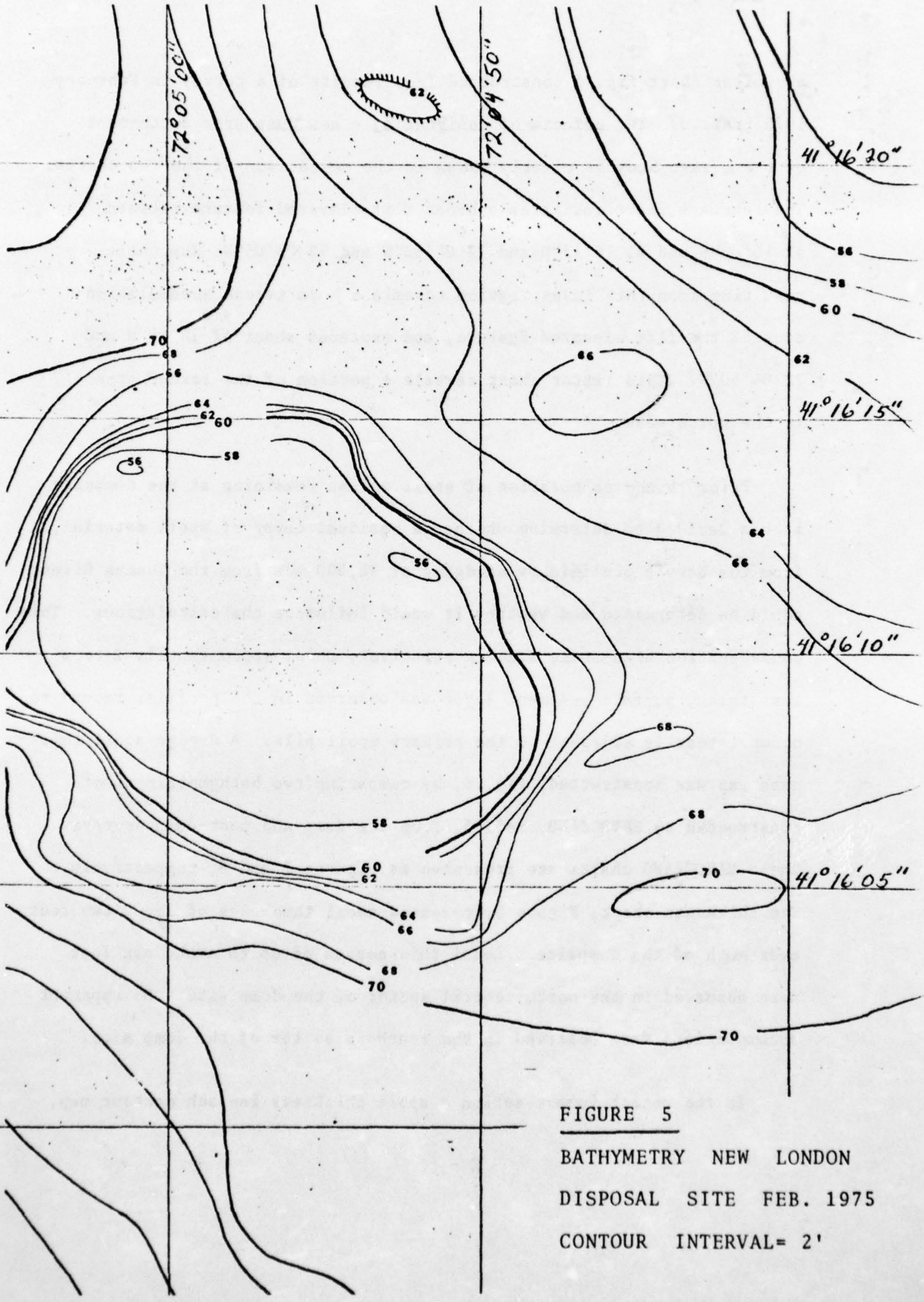


FIGURE 5

BATHYMETRY NEW LONDON

DISPOSAL SITE FEB. 1975

CONTOUR INTERVAL= 2'

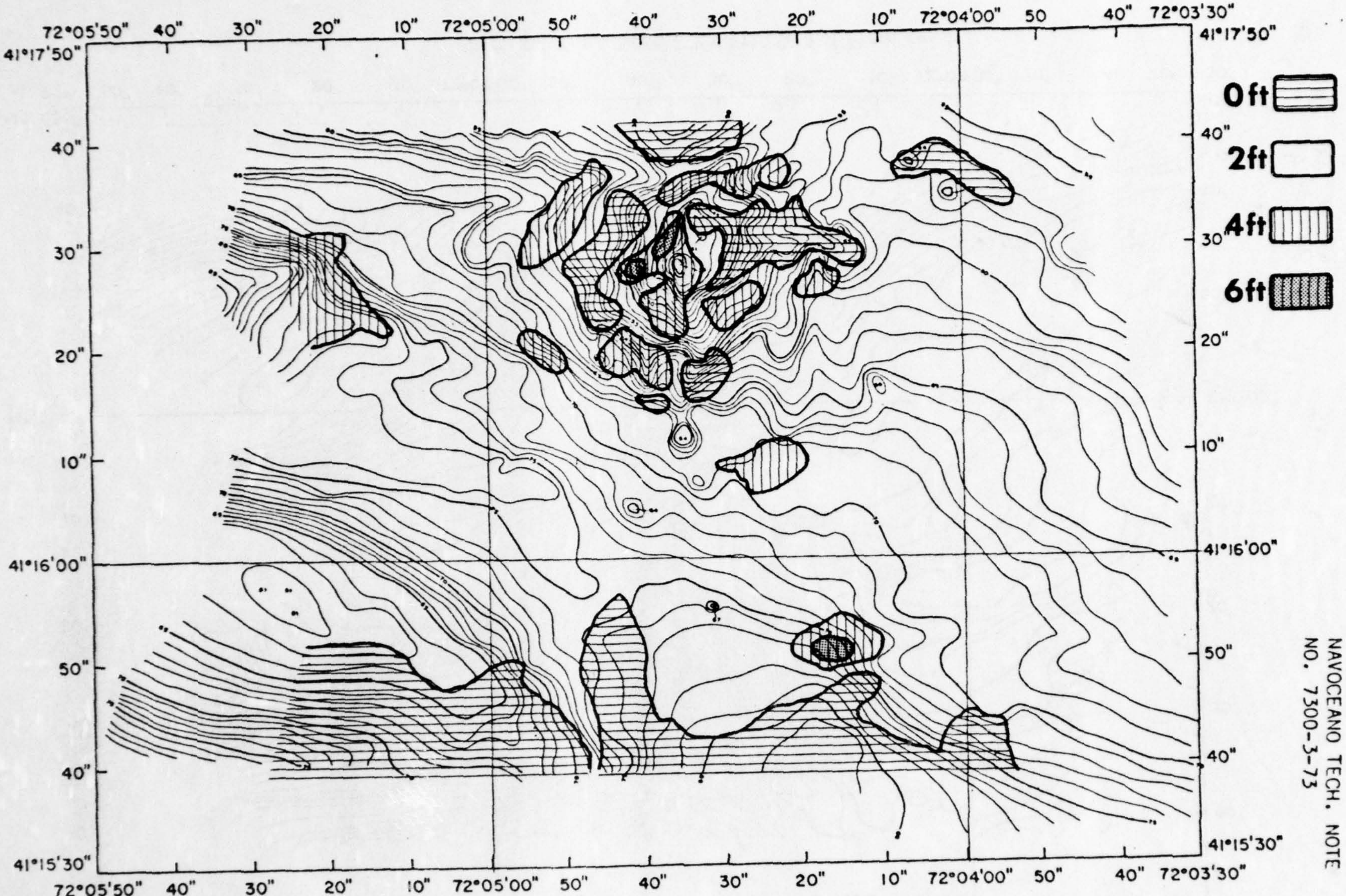


FIGURE 6 Distribution of spoil thicknesses - Preliminary dredging operation

NAVOCEANO TECH. NOTE
NO. 7300-3-73

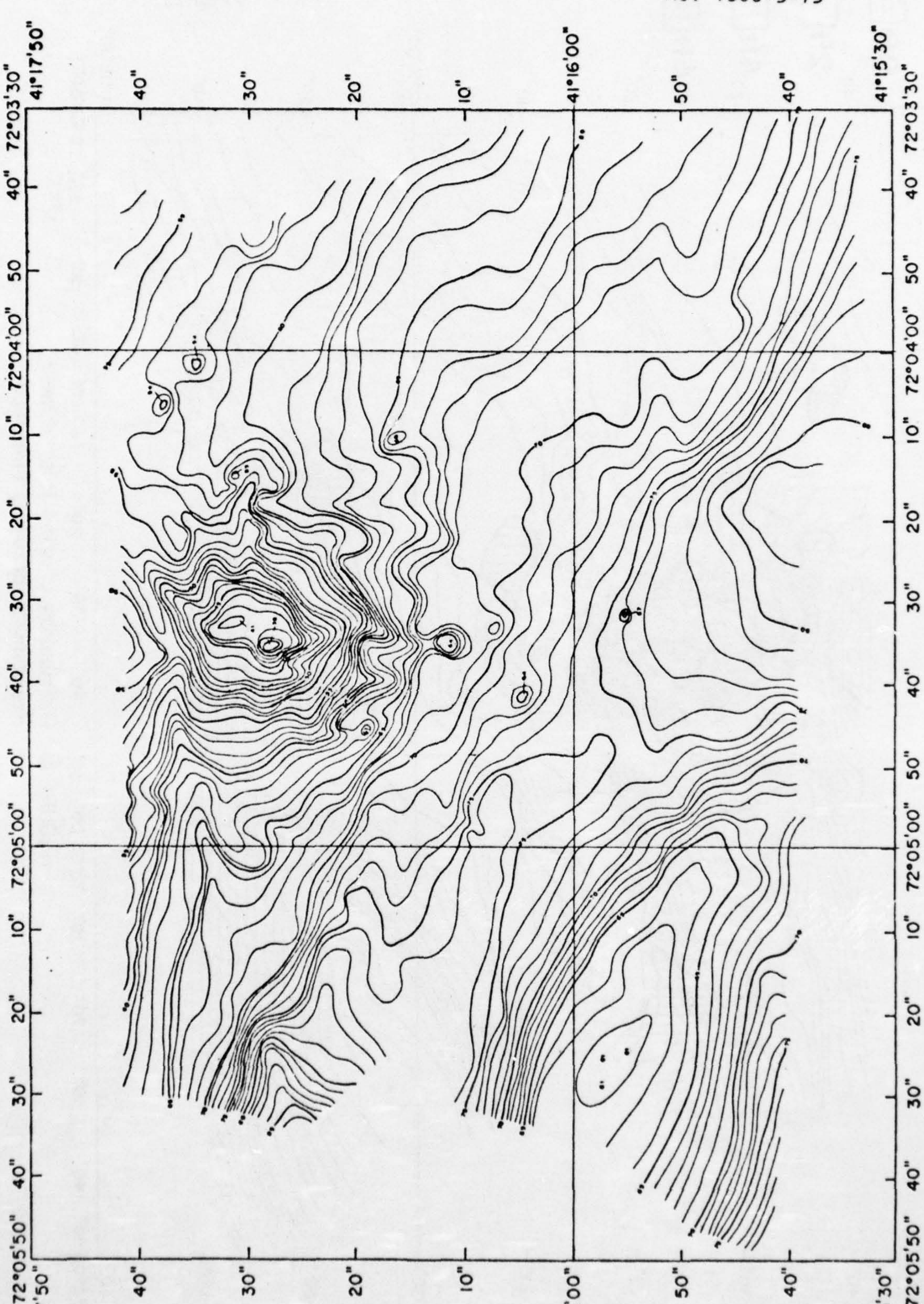


FIGURE 7 BATHYMETRY PHASE 1 (From ref. 5)

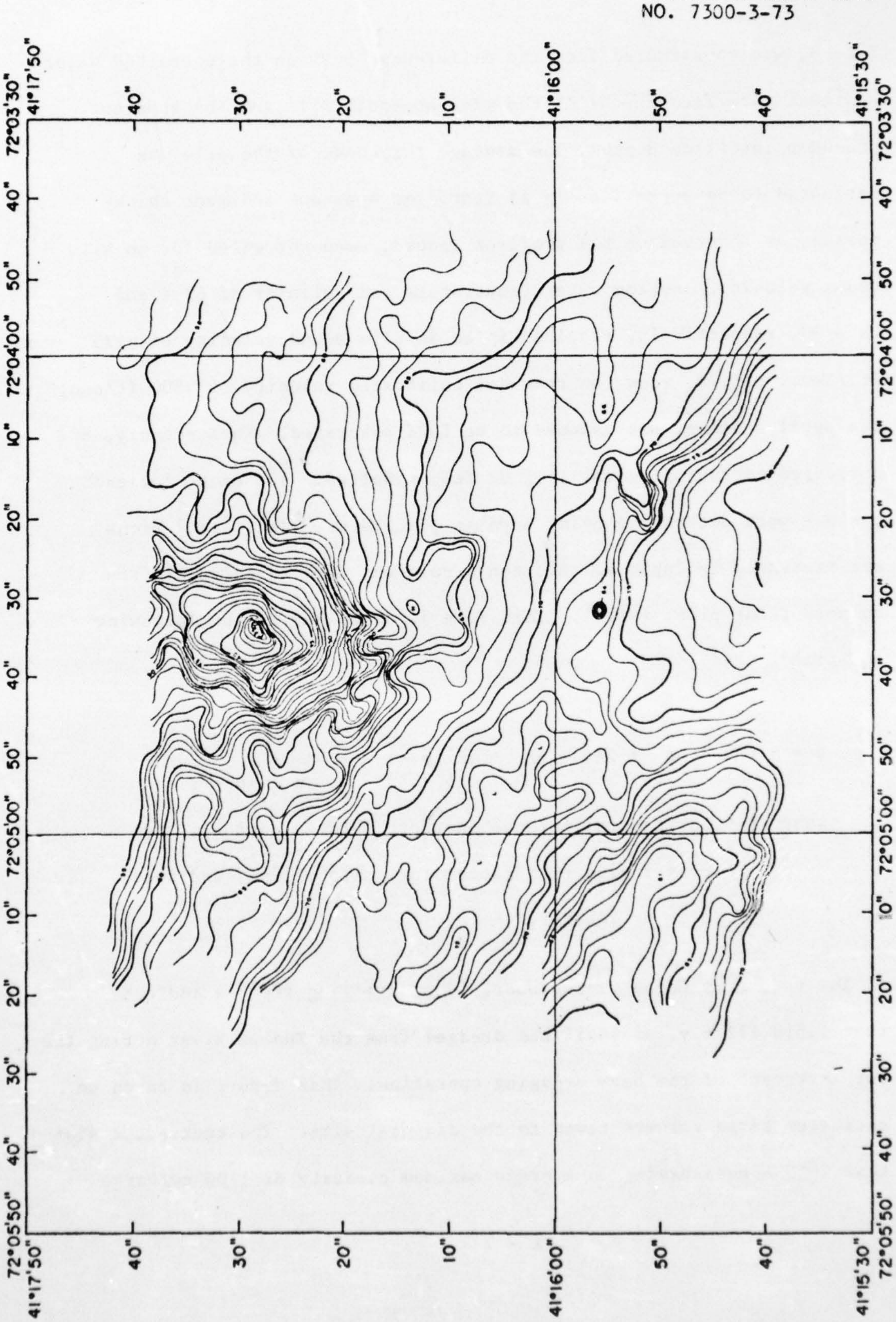


FIGURE 8 BATHYMETRY PHASE 2 (From ref. 5)

AD-A031 433 NAVAL FACILITIES ENGINEERING COMMAND PHILADELPHIA PA --ETC F/G 13/2
FINAL ENVIRONMENTAL IMPACT STATEMENT, DREDGE RIVER CHANNEL: NAV--ETC(U)
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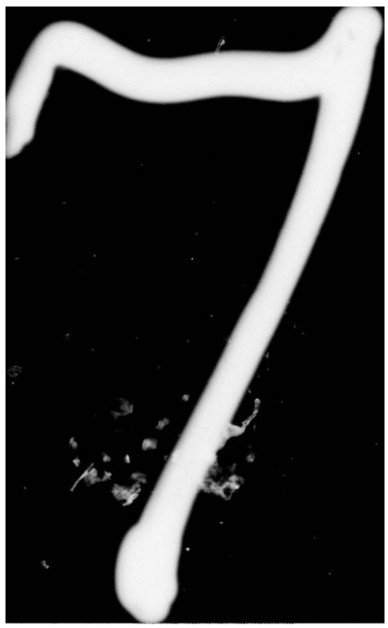
7

Fig. 9, was constructed from the differences between the corrected water-sediment interface depths of the present spoil pile and the apparent pre-dump interface depths. The average thickness of the pile was estimated to be approximately 15 feet. The apparent sediment thicknesses, as observed on the profiler record, were corrected for in situ sound velocity. Bottom water temperature and salinity of 67 ^{o}F and 28 0/00, respectively, resulted in an in situ sound velocity of 4975 ft./sec., ref. 5, vice the recorded calibrated velocity of 4800 ft/sec; the spoil sediment was assumed to be 100% saturated. Consequently, a corrected contour interval of 2.07 feet resulted. The areas for each contour were determined using a polar planimeter. The calculations are presented in Table 4. Simpson's rule was used to calculate the volume of the pile, ref. 1. This rule is described by the following equation:

$$V = \frac{h}{3} (A_1 + 4A_2 + 2A_3 + 4A_4 + 2A_5 + \text{------} 4A_n + A_{n+1})$$

where H = constant difference in depth between contours and

A_n = area inside each succeeding contour line, and where

n is an integer.

The U.S. Army Corps of Engineers (COE) dredging reports indicated that 1,510,112 c.y. of spoil was dredged from the Thames River during the 1st increment of the Navy dredging operation. This figure is based on estimated barge volumes towed to the disposal site. The contractor stated that 1455 barges having an average maximum capacity of 1100 cy/barge

FIGURE 9

DREDGE SPOIL THICKNESS

CONTOUR INTERVAL=2.07'

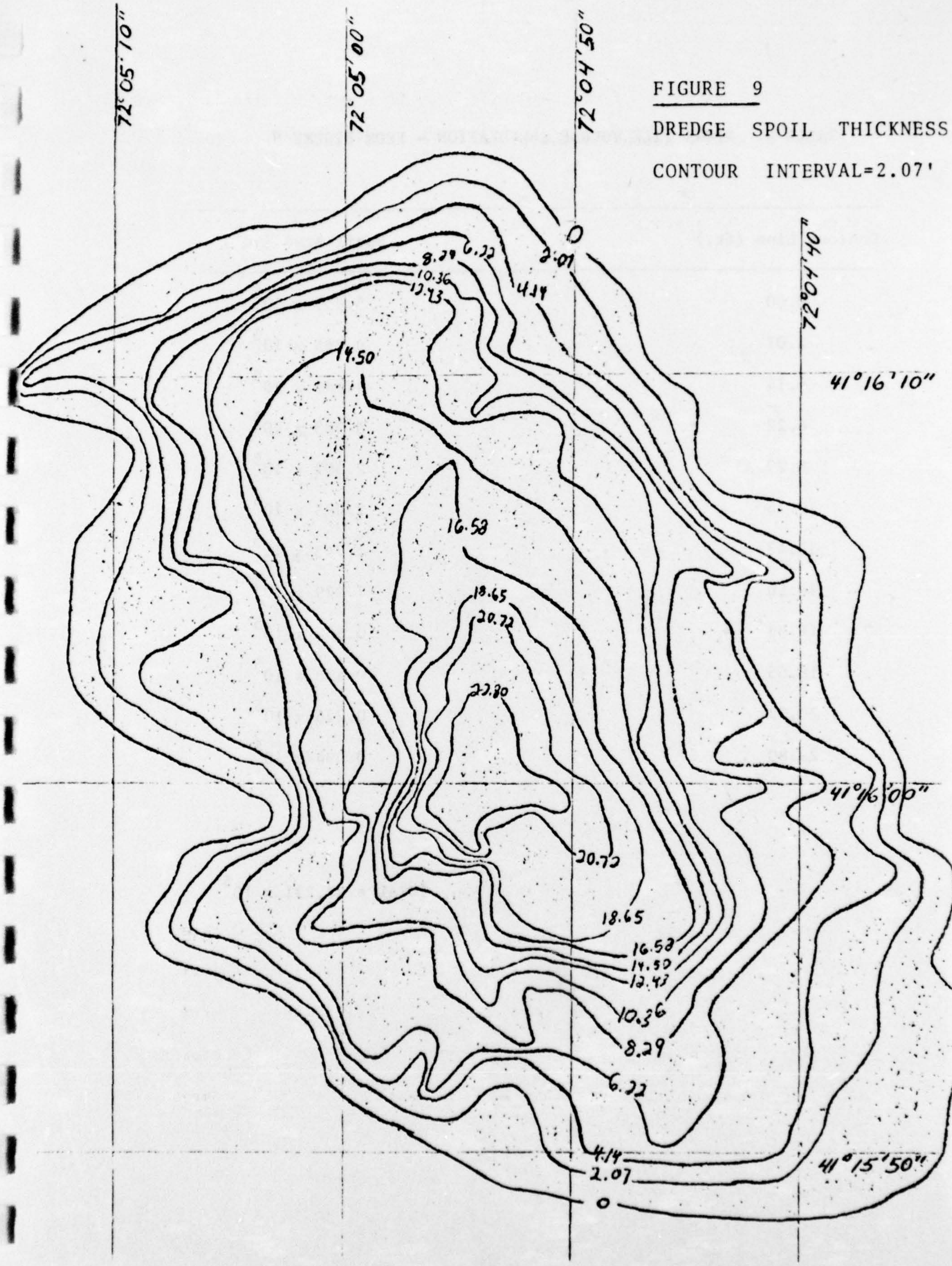

TABLE 4: SPOIL PILE VOLUME CALCULATION - FROM FIGURE 9

Contour Line (ft.)	Spoil Area (yd^2)
0.00	5.855×10^5
2.07	4.895×10^5
4.14	4.086×10^5
6.22	3.383×10^5
8.29	2.501×10^5
10.36	2.093×10^5
12.43	1.743×10^5
14.50	1.229×10^5
16.58	0.688×10^5
18.65	0.438×10^5
20.72	0.226×10^5
22.80	0.094×10^5

TOTAL = $27,231 \times 10^5$

(1,600,500 c.y.) were towed to the disposal site. Based on soundings, the Navy paid for the removal of 1,552,568 c.y. of spoil material.

The calculated volume of spoil detected in the primary spoil pile is 1,611,000 c.y. Also, a preliminary estimate of a relatively thin spoil layer residing immediately east-northeast of the primary spoil pile and within the disposal site limits was detected (3,322 c.y.). This small quantity added to the calculated volume approximates 1,614,322 c.y. However, if the 92,500 c.y. from the Navy's preliminary dredging operation, the 9,000 c.y. from Navy pier dredging and the estimated 4,000 c.y. from Mystic Seaport dredging were included in either of the estimated figures or the Navy pay figure the percent error would range from 0.1% to 5.4% (table 5). These values are considered well within the allowable error range for calculations and instrumentation. In addition, a possible error exists due to consolidation or settling of the spoil pile. Estimated calculations based on comparable conditions, character and quantity of spoils, suggested that consolidation of the spoil pile, at this point in time, may be negligible (ref. 6, 7, 8).

The depression which serves as the New London Dumping Ground runs in the Northwest to Southeast direction. A conservative estimate of the capacity of the New London Dumping Ground based on the results of this study is approximately 25 million cubic yards. This quantity of spoil contained in the depression would reduce the navigable depth above the spoil deposits to 40 feet.

TABLE 5 PERCENT OF SPOIL MATERIAL ACCOUNTED FOR AT THE NEW LONDON DUMPING GROUNDS BASED ON BEST AVAILABLE ESTIMATES.

Estimates of Spoil Volumes		Spoil Accounted for (%)	Error (%)
COE Estimate	1,510,112 cy		
Other Projects	+ 105,500 cy	99.9	0.1
Total Estimate	1,615,612 cy		
Contractor Estimate	1,600,500 cy		
Other Projects	+ 105,500 cy	94.6	5.4
Total Estimate	1,706,000 cy		
Navy Pay Figure	1,552,568 cy		
Other Projects	+ 105,500 cy	97.4	2.6
Total Estimate	1,658,068 cy		

Total quantity of spoil detected by this survey = 1,614,322

A preliminary analysis of the side scan sonar records, with respect to sighting, incidence of scouring or winnowing and subsequent transport away from the pile, were inconclusive. A high automatic signal gain in the recorder could not be diminished and much of the darkened record appears to have masked the finer surface features. A more thorough analysis of these records will be undertaken in the very near future.

An underwater TV reconnaisance survey revealed an active fish population on the spoil pile. A number of flounder and a sea robin were observed. Also, a lobster boat "Debra Lynn" out of Stonington, CT, was working 'pots' in the spoil area on the day of the survey.

As of the date of this survey, the dual frequency bottom profiling system, indicated that 95% of the spoils have been contained within the immediate vicinity of the disposal site and that erosion of the spoil pile may be minimal.

APPENDIX L

RATIONALE FOR PERMIT ACTION: DISCUSSION AND RECORD

(Prepared by New England Division, Corps of Engineers, Waltham, Massachusetts)

CONFLICTS AND ISSUES IN DISPOSAL SITE CONSIDERATION

Specific consideration of the Navy's program to expand its submarine handling facilities began with application in June 1971 for a Federal Permit to construct dock facilities and dredge 65,000 cubic yards. Coordination by the Corps with EPA resulted in an agreement to consider a disposal site located halfway between Montauk Point and Block Island. This selection was based upon EPA's desire to stand by its disposal in Long Island Sound. This agreement was also based upon a study program to be designed to evaluate the feasibility of the site for the anticipated 2.8 million yards in connection with channel deepening - a project brought to light during the permit discussions.

A conference in January 1972 (ref. 1) involving the Federal agencies, States of New York, Connecticut and Rhode Island, commercial fisherman, and dredging industry further circumscribed the problem of site selection. The question put to the conferees was whether it was possible by any means to resolve conflicting rights and interests with respect to use of the ocean bottom, particularly where disposal of dredged material was involved.

The return, generally summarized, was as follows:

(1) There are few if any near-shore ocean bottom areas where either commercial or sport fishing are not important.

(2) The individual states would take measures to protect fisheries' interests against intrusion of new disposal projects into contiguous or adjacent waters.

(3) That disposal operations exposed to open sea conditions combined with a long haul would result in high costs, and might possibly be rendered impracticable by unavailability of properly certificated vessels.

The substance of positions taken by the States and confirmed by later correspondence was that: Disposal would take place either in the waters of the State of origin, or in extra-territorial waters in a location where State activities would not be impacted. This translated into using existing, or historic, dumping grounds, or designating new areas outside States' waters. Sites which were suggested for consideration were in the area between Long Island and Block Island, and the "Acid Barge" area, located 10 miles south of Block Island. (ref. 2) (In later actions, both of these sites were rejected by the States of New York and Rhode Island based on fisheries impact).

The Corps' view, considering the minor amount of dredging involved, and the stated urgency of the work, was that pursuit of a background study plus monitoring for either of those exposed location, would be infeasible. Moreover, it would not address the question of overriding importance which was: Why not use the New London Dumping Grounds? In the absence of scientific data or observed phenomena which would indicate environmental problems after decades of use, and in consideration of a large cost differential in towing distances, the Corps determined that the dumping of 65,000 cubic yards accompanied by appropriate studies would not create unacceptable risks, but would yield valuable insight to future management decisions.

Further consultation with EPA on use of the New London site resulted in EPA not objecting to this disposal action, but based its nonobjection upon the exigency of the work and National Defense considerations. A permit was issued on 29 June 1972 conditioned to include background studies and analyses during and after dumping operations.

THE EFFECT OF PENDING ACTIONS ON POLICY CONSIDERATIONS

Other disposal operations then in the planning stage included Corps maintenance dredging for New Haven Harbor, and an application under consideration for dredging in New Haven by United Illuminating Company. The proposed use of the New Haven Dumping Ground for the above work accompanied by monitoring studies was outlined in a letter to the Commissioner of Connecticut's Department of Environmental Protection (ref. 3) and was the subject of several hearings conducted by Connecticut legislators.

PENDING LEGISLATIVE ACTION

The concern over disposal effects on the marine environment focused attention on legislation enacted in October 1972 which covered, in three separate laws, regulation of the disposal activity. Both the Federal Water Pollution Control Amendments of 1972, and the Marine Protection, Research and Sanctuaries Act addressed disposal directly, and the Coastal Zone Management Act encompassed the activity in a more general fashion. Preparations implementing guidelines under these Acts commenced soon thereafter, and created a virtual hiatus in new disposal activity until publication in May 1973 of Ocean Dumping Regulations.

INTERAGENCY POLICY COMMITTEE

During the period of initial coordination on the Navy's initial disposal project, the Chairman of the New England River Basins Commission suggested a more intensive approach to the disposal problem in Long Island Sound. (ref. 4) The long-range Long Island Sound Study being

conducted by the Commission was not, in his view, the proper vehicle to address the current difficulties being experienced in policy questions. Thereafter, the Corps prepared and forwarded to the Federal agencies heads a proposal to establish a Federal-State interagency committee to act on disposal policy questions. Embodied in the proposal was the formation of a Federal-State scientific advisory sub-committee. This proposal was implemented by signing of a memorandum of agreement. (ref. 5) The Division Engineer of the Corps' New England Division, the Regional Administrator of EPA's Region I, the Department of Interior's Regional Coordinator, and National Marine Fisheries Service (NOAA) Regional Director were signatories, with the River Basins Commission Chairman as an unofficial member, and the States participating when their interests were involved.

THE NAVY DRAFT IMPACT STATEMENT

No formal action was taken by the Corps to designate a disposal area for the Navy's proposed dumping of 2.8 milion cubic yards from the date of application, 23 June 1972, until receipt of a Navy telegram on 24 April 1973 requesting the specification of the Brenton Reef site. A letter to the Commanding Officer at Philadelphia from the Division Engineer on 2 May,1973 lists the reasons for declining this specification as:

(a) Non-availability of implementing regulations under the new acts.
(b) Absence of data as a result of Navy studies on the initial dumping.
(c) Considerations involved in use of Brenton Reef, including:

(1) Use by others
(2) Views of the State of Rhode Island (ref. 6).

The Navy's "Revised Draft Impact Statement" dated May 1973 was issued notwithstanding advice from the Corps, and tentative arrangements were being made by the Navy for public hearings in June. Public reaction was swift and sharply in opposition, particularly from Rhode Island. (ref. 7)

SELECTION OF NEW LONDON DUMPING GROUND AND DEVELOPMENT OF THE STUDY-MONITORING PLAN

Consultations with the Navy eventually brought agreement on postponement of further proceedings on the "Revised Draft EIS" and the role of the Corps as designee of dumping grounds as provided by the legislative acts and EPA guidelines issued in May 1973. The advice of the Scientific Advisory Subcommittee was sought on a proposed plan developed by the Corps in a meeting on June 14, which is detailed in Dr. Pearce's memo of June 20, 1973. (ref. 8) A series of interagency meetings then ensued with the primary effort directed toward the establishment of a program of study for a primary site and for a contingency or "alternate"

site. The first of these was on July 13, 1973 meeting described by Pearce (ref. 9) which established a general plan for study design. A meeting of the subcommittee on August 8, 1973, considered in detail a proposed plan submitted by the Navy. Two public hearings conducted on the Navy application on the dates of 28 August and 11 September brought forth many conflicting views on the use of the New London Dumping Ground, but near unanimity on the need for the dredging project, as reflected in the hearing record (Final EIS).

During this period, the impact of other project activity in the Sound was under consideration by Connecticut, New York and Rhode Island working jointly with th Federal agencies. A tentative agreement, though never finalized, was reached on the consolidation of the historical 19 disposal sites within the Sound into four "regional" sites, located opposite Eaton's Neck, NY in the western Sound, off New Haven, Cornfield Shoals, off the Connecticut River, and off New London. This action was taken in the interest of better monitoring effects of disposal, particularly with the inauguration of the "point dumping" procedure originally designed for New Haven.

The Corps involvement in disposal problems up to this point was recounted in a paper by Hard delivered at a Conference of the International Association for Pollution Control in Montreal, Que., and is incorporated here by reference to place in perspective the multifaceted aspects of the management process. (ref. 10)

As the Corps, with the consultant agencies, examined the question of alternative sites to be explored, several tentative actions were taken and later reversed. EPA's qualified agreement to the use of the "Acid Barge" site, southeast of Block Island, was later negated by response to its own hearing to establish this as a dump site for the Pfizer Chemical Company waste. New York State's objection to the Montauk-Block Island site, based upon sports fisheries impacts, had effectively ruled out that area for further study.

In the interval between the public hearings up to and following issuance of the Navy's Final EIS, in December 1973, a great deal of effort by the Navy and agency scientists was devoted to a study plan. Drafts and revisions were made during this time and comments received thereon. Dr. Pearce's memos of the meetings and other documents detail the breadth of considerations taken in designing a study program.

By the end of March 1974, the long process of drafting an adequate monitoring-study program had been concluded with understandings that NOAA would take the lead role in managing a study program for disposal and contingency site work and the Navy would fund the work at a level of $500,000. A recommendation to issue the permit conditioned by requirements for monitoring and study was reviewed and affirmed by the Office, Chief of Engineers (ref. 11), and a notice of intent sent to the Regional Administrator of EPA. Subsequently, a permit was issued

on the 29th of April 1974 with conditions governing use of the New London Dumping Grounds and scientific studies attendant thereto. When finally assembled as a work program, the study of the New London Dumping Ground by a consortium of marine institutions, with additional allied work by the Corps and the Navy represented one of the most intensive efforts ever undertaken to identify the impact of open water disposal of dredged material on the marine environment. Dr. Pearce's memo of August 19, 1974, details the Scientific Advisory Subcommittee's (dubbed ISASODS) involvement during this lengthy period.(ref. 12)

SELECTION OF "EAST HOLE" AS ALTERNATE SITE

Prior to initiation of the Navy's contract dredging under the first phase of the program, attention was focused on the need to identify a site or sites for further study as alternate of "contingency" dumping grounds.

Suggestions to use one of two depressions in Block Island Sound southeast of Fisher's Island resolved into one, which was dubbed "East Hole", through a process of elimination. Initial surveys indicated that further exploration was warranted though opposition by Rhode Island was noted as a possible future constraint. Further detailed study on the East Hole commenced following a meeting of the Interagency Committee in March 1975 at which the consensus was reached that this was the most practicable choice for an alternate site at the time.

CORPS OF ENGINEERS EXPENDITURES ON NEW LONDON DUMPING GROUND AND EAST HOLE SITE INVESTIGATIONS SUBSEQUENT TO ISSUANCE OF THE NAVY PERMIT

Item	Completion Date	Cost (Thousands)
New London Dumping Ground		
Fabrication and installation of buoys for NOAA investigations	Nov 1974	2.4
Bathymetry of New London disposal site (after ca. 390,000 cu. yds.)	Nov 1974	5.0
Current observations, 3 arrays, 30 days	Dec 1974	17.6
Bathymetry of New London disposal site (after ca. 850,000 cu. yds.)	Feb 1975	5.0
Bathymetry of New London disposal site, TV, photos and diver's observations (after ca. 1,600,000 cu. yds.)	Aug 1975	8.0

Item	Completion Date	Cost (Thousands)
Flume tests for critical erosion velocity	Aug 75	1.0
Current observations, 3 arrays, 30 days	Sep 75	25.0
Bottom boundary layer observations (48 hours continuous current readings of 3 ducted meters set in cage on bottom)	Sep 75	39. 0
Bathymetry of New London site, TV, diver observations, photos	Sep 75	5.0
	Subtotal	108.0
Alternate Site		
Current observations (30 days, incl. West Hole), vertical profiling	Aug 74	10.0
Sediment coring and analyses (chemical and physical testing, 37 locations, incl. West Hole)	Oct 74	48.0
Bathymetry (East and West Holes)	Oct 74	10.0'
Bottom television survey (East Hole)	Aug 75	2.0
Current Observations (East Hole, 30 days and 48 hour continuous bottom boundary layer measurements)	Aug 75	39.5
		109.5
	Total to September 1975	217.5

REFERENCES

1. Attendance list, conference of Jan. 21, 1972
2. Map - portion of USC&G Chart 1211
3. March 1972 letter to Commissioner Lufkin
4. April 28, 1972 letter to Col. Bane from Frank Gregg
5. Memorandum of Agreement
6. 2 May 1973 letter from Col. Osterndorf to CO, NORTHDIV.
7. Letters from R.I. interests
8. Pearce memo dated June 20, 1973 and attached proposed plan
9. Pearce memos dated July 20, 1973 and Aug. 9, 1973
10. Hard speech
11. Letter to OCE 1 March 1974 and return endorsement dated 18 Mar. 1974
12. Pearce memo of August 1974

Jan 21, 1972 Reference

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JOHN H MASON COL CE	NED Corps of Engr

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John Hougere	Dept Natural Resources State of R. I.
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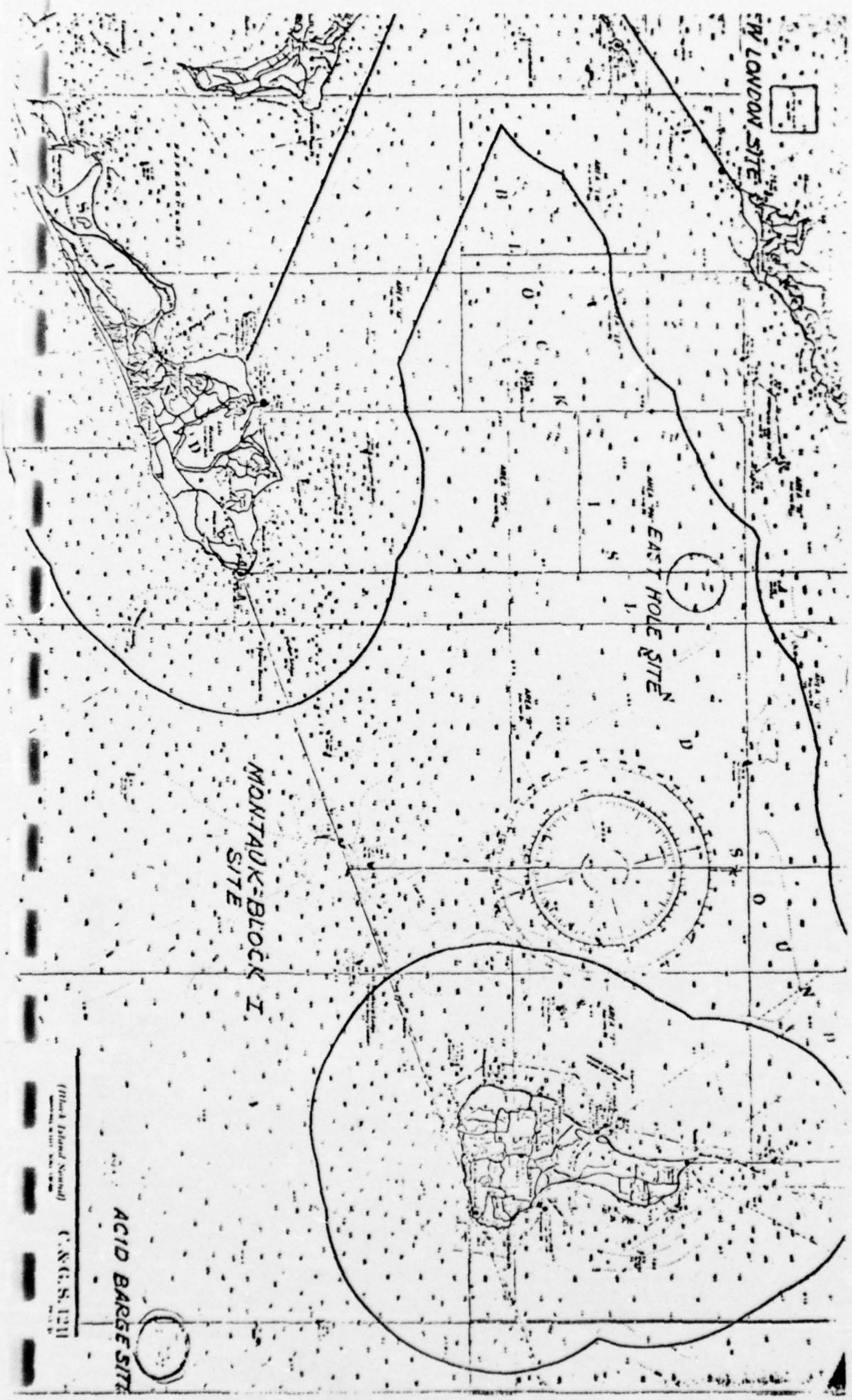
Francis B. Manchester
Manchester Seafoods Inc. } Tiverton, R.I.
Point Trap Co Inc.

John R Allen, atty for Manchester Seafoods + Pt Trap Co Inc.

James M. Violet	Lobster fisherman - Newport, R.I
Capt. Alfred J. Brownell	R.I. FISHERMANS ASSN INC. Pres R.I.
Robert E Chase	EPA Permits
Peter M Klenger	R.I. Dept. of Health

Reference 2



EAST HOLE SITE
MONTAUK-BLOCK I SITE
ACID BARGE SITE
C.&G.S. 1211
(Block Island Sound)

Reference 3

Mr. Andreliunas/mep/322

NEDOD 7 March 1972

Mr. Dan W. Lufkin, Commissioner
Department of Environmental Protection
State of Connecticut
State Office Building
Hartford, Connecticut 06115

Dear Mr. Lufkin:

This letter follows up our meeting in your office on February 22 concerning our dredging programs in Connecticut. Your suggestion that the "problem" of ocean disposal should perhaps be regarded as an "opportunity" struck me as being a fresh and positive outlook on the challenges which we all face in environmental protection.

With this letter, I am submitting for your study a plan for management of disposal for those jobs which are near-term. These were included in the list given to you at our meeting. The considerations of this plan are based upon the best available information to date and particularly on opinions of marine scientists with whom we have conferred. This does not supplant nor obviate the need for filling in the gaps in basic research, or for applied research in those areas considered to be of special interest. It does incorporate our best judgement on the management of materials dumped into Long Island Sound so as to reduce environmental effects outside the area designated as a dumping ground.

It should be understood that in each instance of dredging, alternative disposal methods will be considered and employed if they offer advantages over ocean dumping, and are within acceptable economic limits. Similarly, should monitoring of the operations in progress reveal a condition unacceptable in terms of standards established for that area, every effort will be made to adjust procedures in effect so as to meet those standards.

NEDOD

7 March 1972

Mr. Dan W. Lufkin, Commissioner

With respect to the current dredging program, it is essential that we reach accord as soon as possible if contract scheduling deadlines are to be met. If I find that my projected schedule will not allow contracts to be let by the end of June, I must report the funds to the Chief of Engineers for revocation and use on other projects in the nation. I would therefore appreciate receiving your views by March 17, 1972 as to whether the interim program proposed is acceptable to the State of Connecticut. Certainly, any constructive comments or suggestions will be appreciated.

Please call me or members of my staff should questions or need for clarification arise. We will, of course, be available to meet for further discussion if you desire.

Sincerely yours,

JOHN H. MASON
Colonel, Corps of Engineers
Deputy Division Engineer

Incl:
Plan for Management
of Dredged Material Disposal

CF:
Div Engr
✓Mr. Leslie, Chief, Engrg Div
Reading File
Operations Div File

MFR: Self-explanatory
COORD: Engrg Division ______________
Mr. LESLIE

PLAN FOR MANAGEMENT OF DREDGED MATERIALS DISPOSAL

DISCUSSION

The plan offered here incorporates several basic principles derived from our conferences with marine scientists and based upon prior experience and study. These are:

a. Materials which are polluted or suspected of containing toxic substances (other than oxidizable organics) should be placed in an area of containment versus an area of dispersal.

b. Dumping should be accomplished in a manner which will produce the least possible surface area; that is, concentrated in one spot.

c. Depth of water should exceed 40 feet and the accumulated sediment should not impair navigability.

There have been several approaches suggested for basic research and methods of data collection. Pertinent to all of these are accurate bathymetric mapping, current and net flow measurements, meteorological effects assessment, estimated effect on fisheries, measure of re-population rate and characteristics of fauna, and uptake rate of toxins by creatures as compared with normal backgrounds, and effect on overlying water quality of dumped materials.

Our initial objective is to establish a background condition for the disposal site in terms of physical, chemical, and biological terms to the most accurate and complete degree possible prior to initiation of dumping. Epibenthos fisheries data are conceded to be extremely difficult to obtain and may not be possible within a reasonable time framework. The work will be accomplished by in-house forces, university scientists, or most probably, both. Initial funding will be from project accounts. Further funding is expected to develop from research funds earmarked for this activity, or through resources of the New England River Basins Commission. Monitoring studies most practically would tie into the overall Long Island Sound study effort, the concept being that this will become one of the satellite studies of the basic oceanographic study framework.

Detailed plans for each phase of study will be prepared prior to their initiation following general guidelines developed for the Block Island Sound work, the harbor sediment sampling, and other work cited in references, notably the UI report for the Coke Works project. Standard methods for core sampling, turbidity measurement, biological and chemical testing and analysis will be followed.

MATERIAL TO BE DREDGED

The attached drawings, Inclosure 1, show the extent of materials sampling in New Haven Harbor to date, with an indication of quantities relative to each area defined. A tabulation of analyses keyed to these samples is included. The character of materials and their relative amounts and distribution are described. This is typical of the information being developed on all projects of concern.

DISPOSAL SITE

The attached chart (Incl 2) shows the location of the disposal grounds to be utilized for the dredged materials. Baseline measurements of bottom materials and fauna have yet to be undertaken but will be completed prior to commencement of dredging. From available information, it is believed that this area is one of relatively low energy in terms of tidal current, and is an area of deposition based upon bottom characteristics. Every effort will be made to concentrate the dumping at a fixed location, thereby minimizing surface area of the mass, and offering opportunity for study of characteristics of relief areas in terms of fisheries enhancement. Wherever possible, dredging will be scheduled so as to place materials of less desirable characteristics (i.e., easily suspended or more polluted) on the site first so that they may be overlain with materials of more desirable quality. New Haven Harbor materials offer this possibility.

THE DREDGING PROCESS

Dredging will be accomplished by mechanical bucket of the largest practical size and design which would minimize turbidity in the dredging area. Bottom dump scows will be specified and required to maintain leak-proof pockets in order to minimize turbidity through leakage. This will be accomplished by the use of sand bagging if it

cannot be done mechanically. Tows will be regulated to the extent that weather conditions permit safe navigation and use of required electronic equipment and or visual sighting for location purposes.

MONITORING

During dredging operations, periodic measurements will be made at selected stations and at a test site in an effort to detect environmental changes. These measurements will seek to establish presence of increased turbidity and nutrients in the water column as well as materials deposition on the bottom.

The dump site will be buoyed in order to concentrate material. Each dump will be witnessed by a Federal inspector who will verify the location by radar bearings or visual sighting, or both. Fathometer records will be used to further ascertain location in the event the buoy is displaced. Special observations will take place following severe storms in order to evaluate disturbance of bottom and to detect increased levels of turbidity. The results of monitoring will be reported to DEP and available to others so that decisions can be made on advisability of continuing operations.

Continuing observations of the disposal site will be encouraged in order to study repopulation of benthic fauna and changes in fisheries.

2 Incl
As stated

NEW ENGLAND RIVER BASINS COMMISSION

NERBC 55 COURT STREET • BOSTON, MASSACHUSETTS 02108
PHONE (617) 223-6244

April 28, 1972

Colonel Frank P. Bane
Division Engineer
New England Division
U. S. Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Bane:

At the last meeting of the Coordinating Committee for the Long Island Sound Regional Study we discussed at some length the problems faced by the Corps in connection with dredging and spoil disposal projects for navigation improvement. It seems that controversy surrounds almost every effort by the Corps to dredge and dispose of spoil in the Sound. It also seems likely that such controversy will continue, and may become worse, as time goes on.

After hearing the discussions, it occurred to me that prospects for orderly consideration of dredging needs and associated spoil disposal problems might be encouraged if the Corps were to establish an advisory body on dredging and spoil disposal in the Sound. The Corps is in the middle between needs for navigation improvement (and Congressional instructions to meet these needs), and concern for environmental effects of dredging and spoil disposal. An advisory committee to the Corps representative of interested elements of the scientific community, the public, state and local interests and other Federal interests might provide a forum for reaching reasonable agreements on dredging and spoil disposal.

For instance, a group like this might meet annually to review dredging needs in the Sound and its embayments, and to consider spoil disposal options. An annual dredging and disposal program developed through a visible public process like this might reduce the level of controversy of individual actions. It is also possible that the prospects of getting careful scientific evaluation of dredging and disposal effects might be improved through development of an annual program with the assistance of interested scientists.

I am writing to you as the Corps' member of NERBC. I realize that the North Atlantic Division is also involved, and am taking the liberty of sending a copy of this letter to General Groves.

I think it is accurate to report that this suggestion was supported by both State members of the LISS Coordinating Committee, as well as representatives of other Federal agencies, the Tri-State Regional Planning Commission and the Nassau-Suffolk Regional Planning Board. Newsmen present at the meeting reported on the suggestion. Some of the clippings are enclosed.

Obviously, we will provide the good offices of the Commission in any way we can to help find ways of dealing with the problem. It seems clear, however, that the Corps --which bears the statutory burden-- is the appropriate agency to take the lead.

I look forward to your comments.

Yours very truly,

Frank Gregg

Frank Gregg
Chairman

Enclosures

cc:-- Brig. Gen. R. H. Groves
NAD, Corps of Engineers

Stephen Thomson
Conn. Alternate, NERBC

Ronald W. Pedersen
New York Member, NERBC

David A. Burack
Study Manager, LISS

MEMORANDUM OF AGREEMENT

The undersigned agree that in response to the individual agency responsibilities under the Federal Water Pollution Control Act (33 U.S.C. 1151, as amended), the National Environmental Policy Act of 1969, the Federal Fish and Wildlife Coordination Act of 1958, the Marine Protection, Research, and Sanctuaries Act of 1972, and others, it would be in their overall interest to develop more efficient coordination, exchange of information, advice and ideas on matters involving dredging and disposal of dredged materials and associated research programs. They further agree that these aims will be better served by implementing the following objectives:

A. Establishment of a series of coordinating meetings to be held at least quarterly for purposes of reviewing plans and programs, for exchange of information, and for updating research objectives. The undersigned will constitute the Coordinating Committee who in person or through designated alternatives will represent the views and recommendations of their respective agencies. Views of the individual States will be solicited, and coordination will be effected through invited representatives of cognizant State departments to the quarterly meetings.

B. Establishment of an advisory body of scientists consisting of one scientist member from or engaged by each of the four agencies, to be called the Scientific Advisory Sub-Committee. The sub-committee will evaluate the state of knowledge, develop specific and long-range research objectives and programs, evaluate proposals from others, make recommendations to and advise the Coordinating Committee on scientific questions.

C. Recognizing that the regulation of dredging and dredged materials disposal is vested in the Corps of Engineers, it will be the Corps' responsibility to call and chair Coordinating Committee meetings and to provide other administrative support necessary to the conduct of the Committee's business..

D. Further, recognizing that the Scientific Advisory Sub-Committee should operate with considerable latitude in pursuit of its objectives, the Sub-Committee may organize its membership and establish schedules following the majority consensus, and it may bring in colleagues or outside consultants

freely as dictated by demands of the problems encountered. Costs of supporting each Committee member will be borne by the agency represented.

Regional Coordinator Northeast Region U.S. Department of the Interior	Regional Administrator Region I Environmental Protection Agency
Regional Director Northeast Region National Marine Fisheries Service	J. L. S. Mason Division Engineer New England Division U.S. Army Corps of Engineers

Dated: August 1973

Reference 6

OPERATIONS DIVISION NED
FILE COPY

NEDOD-P 2 May 1973

SUBJECT: Request for Disposal of Dredged Material

Commanding Officer
Northern Division
Naval Facilities Engineering Command
U.S. Naval Base
Philadelphia, Pennsylvania 19112

1. We have received your teletype request dated 24 April 1973 to amend your permit application for dredging in the Thames River to include disposal of spoil material at the dump site commonly known as the Brenton Reef Dump.

2. We cannot comply with your request until several outstanding questions are resolved which have a direct bearing on the most suitable location for disposal.

a. The Environmental Protection Agency has not yet issued its criteria for ocean disposal under the Marine Protection, Research, and Sanctuaries Act of 1972.

b. We are still awaiting the results of monitoring studies of the New London Dump in conjunction with your disposal of dredged material from the vicinity of the submarine pens.

c. The Brenton Reef Dump is already designated as the disposal site for several proposed public dredging projects in Rhode Island and Massachusetts. The additional quantity of material from the Thames River may be an overloading factor.

d. The State of Rhode Island has no legal jurisdiction to deny the Navy dumping. However, it has a great interest in the quality of the waters off Rhode Island and exercises State jurisdiction of private and other public dredging projects. Its views on the matter should be given full consideration.

NEDOD-P 2 May 1973
SUBJECT: Request for Disposal of Dredged Material

3. When these questions have been resolved, the views of the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service must be sought and given full consideration. As you can see, it is quite premature to specify any particular dump site as being most suitable for your project.

4. Several months ago we suggested that informal coordination with the Corps before issuing the Environmental Impact Statement would be helpful. It would answer the obvious first question from any opponent, "Has the dump site been cleared with the Corps and EPA under requirements of the Ocean Dumping Act?" Without first seeing your consultant's reasoning in selecting Brenton Reef, it is impossible for us to make a commitment. Since the dump site you propose is a great distance from the project, it seems to us that the added transportation cost becomes a significant factor to be weighed against environmental impacts. I would be happy to make my staff available to review the Environmental Impact Statement with you prior to its release. In this way, we can avoid any public adversary situation that may arise. It would also reduce formal Corps comments thereby saving time and effort in the formal coordination phase.

5. We wish to do all we can to expedite the permit process and hope to hear from you soon.

REES MAR
ANDRELIUNAS
OSTERNDORF

CF: Opers Div File-Permits
MFR: Self- Explanatory

CHARLES J. OSTERNDORF
Colonel, Corps of Engineers
Acting Division Engineer

WASHINGTON OFFICE:
417 CANNON BUILDING
WASHINGTON, D.C. 20515

Congress of the United States
House of Representatives
Washington, D.C. 20515

COMMITTEE:
APPROPRIATIONS
SUBCOMMITTEES:
HOUSING AND URBAN DEVELOPMENT
SPACE-SCIENCE-VETERANS
DISTRICT OF COLUMBIA

Reference 7

June 18, 1973

Colonel John H. Mason
Division Engineer
U.S. Army Engineers
New England
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Mason:

I have noted with extreme interest the proposal of the Department of Navy to take approximately 3 million cubic yards of sludge from the Connecticut River and dump it at an ocean site off the shores of Rhode Island.

It is my understanding that hearings scheduled for this proposal have been postponed. I want you to know that I oppose this project and will take every step necessary to prevent its implementation.

Please advise me if any action is contemplated by your office in the near future. I would want to know, obviously, if a new date is to be scheduled for hearings in this matter.

Sincerely,

Robert O. Tiernan

ROBERT O. TIERNAN
Member of Congress

T/dh

THE CITY OF NEWPORT, RHODE ISLAND 02840

May 31, 1973

Department of Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Gentlemen:

At a special meeting of the Council of the City of Newport, held on May 30, 1973, the Council adopted the enclosed resolution vehemently protesting the Navy Department's plans to dredge the Thames River in the State of Connecticut and dumping the sludge at an ocean site off the shores of Newport.

Very truly yours,

Robert A. Shea

Robert A. Shea,
City Clerk

RAS:jm
Enclosure

01 JUN 1973

RESOLUTION

OF THE

COUNCIL

No. 83-73

WHEREAS, the Navy Department has plans to dredge the Thames River in the State of Connecticut and dump the sludge to an ocean site off the shores of Newport; and

WHEREAS, this project would be most detrimental to commercial fishermen and lobstermen already harassed by Russian trawlers and foreign competition and would have an unfavorable impact on the environment, and contribute even more to rising prices in the fish and lobster market. Now, Therefore, Be It

RESOLVED: That the Council of the City of Newport vehemently protest this project and authorizes the City Manager or his designee to present the City of Newport's objections to this project at a hearing to be held June 14, 1973, at the University of Rhode Island.

HUMPHREY J. DONNELLY, III   GEORGE D. WEAVER

IN COUNCIL

READ AND PASSED

MAY 30, 1973

Robert A. Shea

Robert A. Shea,
City Clerk

SAVE THE BAY, INC.
655 MAIN STREET
EAST GREENWICH
RHODE ISLAND 02818
TEL. 884-7887

SAVE THE BAY

May 31, 197

Dept. of the Army
New England Division
Corps of Engineers
Waltham, Mass.

Gentlemen:

The recent news story in the Providence Journal telling us that the U. S. Navy is planning to dump dredged spoils in the Brenton Reef dumping grounds is upsetting to say the least.

Your office is very familiar with the sensitive attitude of Rhode Island fishing interests and environmental groups to further exploitation of R. I. waters. Consequently, the "citizens-be-damned" attitude of the Navy is deplorable and not to be tolerated.

We wish to be recorded as opposing the plan to dump Connecticut dredgings in Rhode Island waters and plan to protest this proposition with all the energy and influence at our command.

Cordially,

John T. Scanlon

John T. Scanlon
Executive Director
SAVE THE BAY

JTS:vm

01 JUN 1973

Reference 8

June 20, 1973

Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

John B. Pearce, Chairman
Scientific Subcommittee on
Ocean Dredging

Subcommittee Meeting Held at Newark Airport, June 19, 1973

Mr. Russell T. Norris, Regional Director
Northeast Region
Federal Building
14 Elm Street
Gloucester, Massachusetts 01930

The subject meeting was called on Thursday, June 14, to discuss a problem the Corps of Engineers has had with regard to the disposal of sediments to be dredged by the U. S. Navy from the Thames River, New London, Connecticut. Mr. Vyto Andreliunas and Mr. Carl Hard represented the New England Division, Corps of Engineers. Dr. Jan Pragar, Water Quality Laboratory, Narragansett, Rhode Island, and Dr. John Pearce represented the Scientific Subcommittee.

The Navy proposes to dredge 2.9 million cubic yards of sediments from a new submarine berthing area during a period of two years to commence in October of 1973. The Navy would presently be willing to barge these sediments some 50 miles to the Brenton Reef site, previously investigated by Dr. Saul Saila, University of Rhode Island.

A relatively short term study has been conducted by the Navy (NAVOCEANO TECH. NOTE NO. 7200-3-73) on a site immediately outside the mouth of the New London Harbor. Approximately 90 thousand cubic yards of spoils generated by maintenance dredging have been dumped at this site in recent months. The Corps of Engineers is technically responsible, under recent legislation, for delineating the dump site to be used by the Navy.

The Navy has indicated that it would consider dumping outside the waters separating Montauk Point from Block Island. In all instances, however, it would appear that the public and the fishing community might object to the establishment of any new dredge spoil disposal sites. Within the past two weeks the Navy had proposed to to have public hearings on the matter but apparently was encouraged by the New England Division, U. S. Army Corps of Engineers, to postpone any such hearing. During the subject meeting numerous suggestions were made as to how <u>any</u> sites would be selected and were there other alternatives to ocean dumping. Dr. Pragor suggested that HUD was tentatively planning to develop new public housing in an area called Shaw's Cove outside of New London. The Corps representatives felt, however, that it would be impossible to use the spoils from the New London dredging since the Navy wishes to conduct its dredging in the immediate future and the HUD project is probably some years in the future.

Both Dr. Prager and Dr. Pearce suggested that the public, or at least segments of the interested public such as the fishing industry, municipal and state officials and members of various conservation agencies, be involved in the initial planning stages for future dredging and disposal activities.

Mr. Hard of the U. S. Army Corps of Engineers indicated that the Navy will have available substantial funds to support additional research at the New London site. Mr. Hard believes that a study of the hydrography in western Long Island Sound and Block Island Sound would be important for any future management decisions as to new dredge spoil areas.

Dr. Pearce developed a sequence of events which might allow the Navy to initiate their dredging activities on schedule, i.e. sometime in October or early November of 1973. First, the Navy would be authorized to dump at the existing dredge spoil site off the mouth of New London Harbor. The Navy is conducting a short term study at this site which indicates that the disposal activities, to date, have not caused significant damage in the area. Second, as soon as possible the Navy should begin a monitoring of the biological components, turbidity effects and effects of heavy metals and other toxins in the water column. If any deleterious effects are noted from the initial disposal activities the Navy would be required to cease dumping and establish a new disposal site in a more appropriate area. Third, at the same time that the monitoring phase of the study begins, an intensive study of the hydrographic characteristics of eastern Long Island Sound, Block Island Sound and offshore areas, be undertaken. Fourth, at the same time as the foregoing proposed studies are underway the Navy and the U. S. Army Corps of Engineers would be responsible for initiating studies as to the possible alternatives to ocean dumping in the southern New England area. Alternatives might include using dredging spoils for reclamation of disturbed or destroyed marsh land using the cleaner spoils for land fill for housing developments, etc. Fifth, and finally, the above activities should be done with a total involvement of the community, i.e., planning should be done with representatives of the fishing industry, conservation groups and general public well aware of the reasons for the various activities. This should dispell the suspicion that the Corps of Engineers and other agencies are proceeding with projects inimical to the best interest of the public.

It was agreed that the Corps is to develop, in the next two or three weeks, an outline of the research activities which it believes to be essential for future studies in the Long Island Sound area. This outline will be furnished to the members of the Subcommittee along with the environmental

impact statement prepared by the Navy on dredge spoil disposal activities to date at the New London site. The Subcommittee will then amend or develop a set of recommendations in regard to the types of studies which should be most effective in providing information to environmental managers and agencies responsible for ocean dredging. The New England Division, Corps of Engineers, would then sponsor or plan a hearing in which representatives of the fishing industry, conservation groups, etc. could be advised of the plans for research at the New London dredging site as well as possible alternatives to ocean disposal and dredging spoils.

Finally, the Subcommittee and members of the Corps of Engineers had a brief discussion of similar problems in Massachusetts Bay where studies are already underway but apparently with no overview as to the objectives and management of the data to be obtained from these studies. The studies in Massachusetts Bay include the NOMES, BIOME and other studies sponsored by state and other federal agencies.

cc: Center
V. Andreliunas
C. Hard ✓
J. Pragar

Project

The U. S. Navy has planned the deepening of the New London Harbor channel to 37 feet to the submarine base, requiring dredging of 2.7 million cubic yards. Analysis of sediment indicates that it is clayey organic silt with no unusually high concentrations of metals or other contaminants which would pose special problems. The work will be done over a 2-year period, commencing late fall of 1973.

Statement of Problem

A disposal site for the dredging must be prescribed by the Corps of Engineers and concurred in by the EPA. The nearest established dumping ground is a 1-mile square just south of the harbor mouth. This has been used in past years for maintenance dredging and non-Corps work. Other dumping grounds lie westward in the Sound. The nearest eastern location is at Brenton Reef in Rhode Island Sound.

Considerations

Considerations involved in dumping are dispersal effects upon fisheries, release of nutrients to water column, and any other physical effects upon ocean environs. It is desired to establish a dump site which will minimize adverse effects of such dumping. Not the least consideration is the continuing adverse public reaction generated by any ocean dumping. It therefore appears to be a practical impossibility to establish a new dumping ground within the waters of any adjacent State. This resolves into whether to dump within Connecticut waters of the Sound, or outside the territorial limits of any State. The extra-territorial waters are productive fishing grounds, however, and the designation of a site must be made with an eye toward avoiding possible conflict on this issue.

Proposed Plan of Action

As noted in Navy's EIS, other sites have not been looked at sufficiently to establish whether they are suitable. Navy observations last year on New London Dump are not in sufficient detail, but preliminary judgment is that there are no sufficiently strong reasons to reject this

Proposed Plan of Action (Cont'd)

site, out of hand. Therefore, in order to allow the work to proceed, the New London Dumping Ground would be designated as the primary disposal site. A program of study, based upon preliminary work completed and the need to establish tidal regimen and behavior of dumped materials, will be conducted in this area, commencing immediately and continuing throughout the project life. Concurrently, additional studies will be mounted in at least two other suggested sites to determine feasibility as alternative dumping grounds. The data from these studies will be monitored as it is assembled in order to be in a position to make judgments:

(1) In the event the New London site becomes stressed;

(2) In the event the site being explored shows undesirable characteristics and a different location should be selected.

Thirdly, a fisheries study would be conducted by people cognizant of commercial activity in and near the areas being explored by the scientists.

Objectives of preliminary meetings would be to:

(1) Determine alternate locations to be surveyed;

(2) Determine framework of studies to be accomplished;

(3) Consider the expertise necessary and availability of people to do the work.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

Reference 9

July 20, 1973

Mr. Carl Hard
Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Carl:

Enclosed please find a memo For the Record in regard to the subject meeting. If you have any comments on this matter, I would be glad to have them.

Sincerely,

John B. Pearce
Chairman, Scientific Subcommittee
on Ocean Dredging and Spoiling

Encl:

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

Date: July 20, 1973

John B. Pearce

Reply to Attn of: John B. Pearce, Chairman
Scientific Subcommittee on Ocean
Dredging and Spoiling

Subject: Meeting of the Scientific Subcommittee on Ocean Dredging and Spoiling, Waltham, Massachusetts, July 13, 1973

To: For the Record

The meeting was called to 1) review the current situation in regard to the U. S. Navy dredging 2.8 million cubic yards of sediment in order to enlarge the submarine berthing areas, New London, 2) review a Corps generated proposal for study of alternative ocean disposal sites, and 3) present specific views of the Scientific Subcommittee on the New London dredging operation.

A handscript list of attendees is attached.

The meeting opened with the Chairman of the Subcommittee, Dr. John Pearce, asking the Corps and Navy officials to review their positions on the proposed dredging in New London Harbor. Questions were permitted from the floor.

Dr. Pearce then presented the subject views of the Subcommittee. Generally, these included the concept that agencies involved in New London dredging must have plans for: 1) monitoring of the specific New London dredging and spoiling sites, 2) investigation of new, alternative ocean dumping sites, 3) investigations of alternatives to all ocean disposal, and 4) long term research which would consider specific, generalized effects of ocean dredging and spoiling, i.e. turbidity effects and hydrography of Long Island Sound, Block Island Sound and waters which might carry sediments from dredging and spoiling sites. At this point, Mr. Steever, Connecticut DEP, stressed his support for some overall coordination and support of research between the various agencies which dredge and dump in Long Island Sound and southern New England coastal waters. He stressed that the Sound is a single body of water which is affected by the totality of activities, not simply the individual projects; he mentioned the concept, held by New York and Connecticut, of using only four disposal sites in the Sound.

Don Phelps, EPA representative on the Subcommittee, emphasized the importance of having a thoroughly investigated alternative spoiling site located offshore on the Continental Shelf.

The Subcommittee recognized the New London spoiling site as the best site to use at the present time; it saw no need to transport spoils to another

site further to the east. The Navy indicated that it would be willing to use the New London site and the Corps of Engineers concurred; in fact, one Corps representative felt it would be irresponsible not to use the New London site for disposal of spoils from the submarine base.

The Subcommittee recommended that if a monitoring study at the New London spoiling site indicated deleterious effects due to the dredge spoils, the spoiling operations would be moved offshore to the alternative offshore spoiling site. When asked whether the Navy would or could do this the Navy representatives stated they could not answer at the present time. A brief discussion of the economics of long-distance hauling ensued.

The Chairman of the Subcommittee asked for a concensus on the New London spoiling site as well as the various offshore sites. The Corps and Navy officials agreed on the New London site for immediate operations and a joint discussion resulted in a consensus by all present that two alternative sites should be investigated: the first is a site in Block Island Sound to be selected on the basis of a fisheries survey (site IIa) and the second is a site in the "flat area" SE of Block Island (site IIIa).

A Corps representative asked if Navy would be prepared to conduct the monitoring study with inhouse personnel or would it be done by contract. The Navy replied that it would probably prefer to conduct an inhouse study. A Corps representative suggested that the fisheries (biology?) research be done by contract with specialists such as Dr. Saul Saila. Even though the Subcommittee would review all proposals and reports it suggested that some contract work be done in order to avoid accusations of prejudice in the final reports.

A discussion of the cost of these studies ensued. The Navy would bear the expense of the research at the New London dredging and spoiling sites as well as the alternative sites designated IIa and IIIa in the Corps prepared draft proposal on "Study of Alternative Ocean Disposal Sites, etc."

The Navy agreed to prepare a proposal for research which would be received by the Subcommittee by 30 July 1973. The Subcommittee would review the proposal internally, but also have the privilege to solicit comments from other scientists.

Following this review the Navy would consider the comments and implement necessary changes in the proposal.

The Subcommittee will also have the responsibility to review all interim and final reports concerned with the operations at the New London dredging and spoiling sites as well as the alternative offshore disposal sites. The Subcommittee should further be party to all decisions in regard to evaluating the effects of the New London dredging and spoiling operations. Most importantly, the Subcommittee would have a responsibility in the recommendation of the use of alternative disposal sites.

Finally, the Subcommittee feels that it would be important that the full committee or representatives of the committee, be present at public hearings concerned with the New London sites and operations.

Encl:

V. [illegible]	C/E, NED
C. [illegible]	" "
G. Pesch *	NWQL, EPA
D. K. Phelps	" "
John B. Pearce	Sandy Hook Lab, NOAA
James W. [illegible]	Cornell U.
Gerald J. Rogers	Northern Div. NavFac EngCom
Charles Bittenbring - Code 0514 -	Naval Facilities Engineering Command Headquarters - Washington
Carl Zillig	CNO (OP45) Tel 202-OX7[illegible]
CDR B.E. [illegible]	Oceanographer of the Navy 202-762-2846
Edward L Ridley	Naval Oceanographic Off
R. O. Ham	Naval Submarine Base. Gr
W. Frank Bohlen	UConn - Marine Sciences Ins
R. [illegible]	C/E, NED
J. Gallagher	US Navy u/w Syst. Ctr, Newl
G. L. [illegible]	" " " " "
S. J. [illegible] (Stever) Rm 207	Director Waterways [illegible] Gen. [illegible]
	D.E.P. Hartford Ct.
C. T. Way	NorNavFacEngCom: Phila
Bob Scheirer	U.S. Fish & Wildlife Service, Concord
Morgan Rees	Corps of Eng.
Frank Dayton	Corps of Eng.
Bert Fisch	Naval Underwater Systems Ctr. Newport

STUDY OF ALTERNATIVE OCEAN DISPOSAL SITES
FOR DREDGED SPOIL NEAR NEW LONDON, CONNECTICUT
PHASE I

PURPOSE:

To establish a scope of study to be associated with disposal of 2.8 million cubic yards of dredged spoil material from the Thames River, Connecticut. Disposal will be made at the New London Dumping Ground unless the study program shows unacceptable environmental effects may occur. An alternate disposal site would then be selected based on study data from the other alternative areas.

Orientation of Study:

Emphasis on fishing grounds, fish nursing areas, and hydrographic conditions

Geographic Areas:

I - East end of Long Island Sound

II - Block Island Sound

III - Near shelf area south of Block Island

Area I East End of Long Island Sound

a. Existing dump site off the mouth of the Thames River

b. The Race

Area II Block Island Sound

a. Site to be determined on the basis of fisheries survey

b. Deep area east of Fishers Island

COORDINATION AND REPORT:

Frequent communication and coordination of activities with those of University of Connecticut and University of Rhode Island investigators performing related work west and east of the subject sites. Integration of findings of all studies. Conferences and seminars during progress of work, involving Interagency Scientific Advisory Subcommittee.

FUTURE PHASES:

Determined as work progresses via feedback through conferences and consultation with Advisory Subcommittee.

National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

(17)

Date: August 9, 1973

Reply to Attn of: John B. Pearce, Chairman
Interagency Scientific Advisory Subcommittee

Subject: Meeting of the Interagency Scientific Subcommittee on Ocean Dredging and Spoiling, Waltham, Massachusetts, August 8, 1973

To: FOR THE RECORD

The subject meeting was called to review a proposal prepared by the Office of the Oceanographer, Department of the Navy, entitled "Environmental Monitoring Plan, Thames River Dredging Project, New London, Connecticut." Copies of this proposal were sent to all members of the subcommittee under a covering memo dated 31 July 1973. The proposal is included with this memo as attachment 1. Attendees at the subject meeting are listed in attachment 2. The meeting was called to order at 1000 hours by the subcommittee chairman, Dr. John Pearce. Comments on the proposal were requested from the members of the subcommittee. Each major section of the subject proposal was reviewed independent of the other sections. Dr. Pearce requested that all comments be furnished to him in writing for eventual enclosure with the minutes of the meeting.

The first section to be considered was section 1.0. Dr. Phelps' first comment was that the subcommittee is concerned with more than what effects dredging would have on the hydrography of the Thames River; in fact, the studies should emphasize the alternative effects of dredging and spoiling on the living resources of the Thames River and the various disposal sites. He also questioned the number of stations to be sampled at the Thames River dredging site. It is thought that rather than having a definitive station within the river we should consider five zones along the length of the river and our interest should be principally with the effects which dredged induced turbidity might have at different points within these zones. Dr. Phelps also would like to have the chemical characteristics of the seston investigated. The seston is here considered to be those materials which are naturally in suspension as well as the materials that are put into suspension by dredging operations. The seston would be analyzed for the materials which are listed under section 2b in a memo from the Office of the Oceanographer of the Navy dated 2 August 1973 and included with this memo as attachment 3.

The analyses of the seston should be correlated with work presently done by Dr. Andrew Norwalk. The analyses of the seston should also be conducted before, during and after dredging.

Interagency Scientific Subcommittee
Meeting, August 8, 1973 August 9, 1973

Mr. Carl Hard stated that the work done by Dr. Saul Saila in Buzzards Bay should also be parallel to the work done in the Thames River estuary by the Navy or by a contractor to the Navy. There was some discussion about this point and the subcommittee concurred that the work to be done by the Navy should be coordinated with the research conducted by Saila and Norwalk. This work should be initiated, if at all possible, in late August or early September and this may mean that the Navy will have to make available some funds for research prior to issuance of a permit by the U. S. Army Corps of Engineers. The alternative goal of the research concerned with seston is to determine the types of material that are put into suspension, transported by river or tidal currents and eventually enter into marine food chains.

The seston analyses might be be done by a water quality laboratory recommended by members of the subcommittee.

The next section of the proposal to be considered was 2.0. The conversation about the alternative dump sites during the subject meeting was concerned with recent legislation which would make it difficult, and perhaps impossible, to dump other wastes in Block Island Sound. There was some discussion as to whether dumping areas at the center of Block Island Sound would be outside the jurisdiction of the State of Rhode Island and there was further consideration as to whether or not the state can prohibit dumping connected with federal projects. Morgan Rees said that Rhode Island is taking a strong stand in regard to ocean dumping. Cdr. Stultz believed that Block Island Sound, or parts of Block Island Sound, are outside state jurisdiction. Dr. Phelps suggested that we do not seriously entertain sites in Block Island Sound or other areas which might be highly controversial. Other members of the subcommittee, including Drs. Pearce and Eipper, concurred with this suggestion. Mr. Hard stated, however, that we must consider all potential alternate dumping sites since offshore weather conditons might preclude the use of a site in the open ocean off Block Island. Later during the subject meeting this problem was again considered in detail and it was resolved by the subcommittee that a reconnaissance survey would be made in Block Island Sound to locate areas which might be out of state jurisdiction, would not be centers for commercial and sport fishing and which might have suitable water depths for dredging spoils.

Section 2.1.1 was then considered by the subcommittee. The subcommittee wanted to know the accuracy of the bathymetry that would be used in the survey. The Navy indicated that depth control intervals would be plotted

on the basis of one foot intervals. The positioning of stations would be conducted with accuracy of less than 100 feet±.

The subcommittee then considered section 2.1.2. Dr. Pearce asked if we were talking about samples or stations. It was then resolved by the subcommittee that the bottom samples would be taken at a series of stations along two transects arranged as a cross; the center of the cross located at the designated point for spoiling. There would be a total of 15 to 20 stations arranged along the two transects. The arm of one transect might be greatly elongated to the other three arms or radii. The elongated arm would point in the direction of extensive water movement which might be induced by currents, tidal waves, etc. It was felt that in this case the Navy could consult the sampling pattern devised by Dr. Saila in his studies of dredge spoil disposal areas.

It was recognized that the distribution of sampling stations along the two transects may or may not be similar in the alternative spoiling site and at the designated spoiling site off the mouth of the Thames River estuary.

It was also recommended that the Corps of Engineers furnish to the subcommittee and the Navy the exact latitude and longitude for the site off the Thames River estuary and the alternative dumping site off Block Island. In addition to the exact position, any graphics showing contour intervals should also be made available to members of the subcommittee and the Navy.

Section 2.1.3 was altered to read as follows: "Quarterly measurements of 30 day duration will be made to determine wave height, wave spectra and significant wave heights." This was done because the Corps of Engineers as well as members of the subcommittee concurred that new wave data should be acquired for the alternate disposal site. This will be extremely important in recommending to barge operators the type of vessel conformation that might be required to use the site during adverse weather.

Considerable discussion revolved around section 2.1.4. The subcommittee believed that in addition to surface and bottom current positions there should be a mid-depth position on any string of current meters. Dr. Phelps recommended that there should be at least two other complete sets of current meters at the alternative dumping site. Mr. Hard suggested that in addition to the current meter array there should be 24 hour anchor stations conducted to obtain current data at the alternative dumping site. The Navy felt that this would result in considerable

(A)

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expense that might not be justified. They prefer to have a single array of current meters with the 24 hour anchor stations conducted once a month. The subcommittee insisted upon having a mid-depth current meter on the single array throughout the year. It was emphasized that the 24 hour anchor stations would make it possible for the Navy to conveniently collect water samples for various analyses, particularly dissolved oxygen, at bottom. Dr. Pearce suggested that it would be important to buoy the station with a permanent lighted buoy. This would make it possible for all investigators interested in the station to find the exact location of the sampling area.

Section 2.1.5 also resulted in considerable discussion. Members of the subcommittee questioned if these analyses were required, at least on a quarterly basis. Most felt that water conditions can vary extensively on even a daily basis and, therefore, they felt that one set of measurements might provide the necessary information. It was finally resolved, however, that since there would be 24 hour anchor stations taken on a monthly basis dissolved oxygen could be measured monthly and the other parameters indicated in section 2.1.5 would be measured quarterly. It was suggested that measurements be the same as those given in attachment 3 to this memo.

Considerable discussion was given to section 2.1.6. It was resolved that plankton data would not be necessary, nor would it be necessary to sample for pelagic species. The rationale for these discussions is again centered in the fact that plankton and pelagic species within the water column change almost daily and quarterly measurements would have no real meaning. It was recommended that the Navy not attempt to sample for plankton and pelagic fish.

It was emphasized, however, that a more detailed benthic sampling program must be developed. It was recommended that a Smith McIntyre bottom grab of at least 0.1 m^2 be used. If a Smith-McIntyre grab is not available a van Veen sample should be used. It was recommended that at least three samples be taken at each station during each quarterly sampling. The sampling stations for benthic macrofauna will be the same as those stations sampled for heavy metal analyses, grain size distribution analyses, etc.

The number of grab samples to be taken at each sampling station may be changed at a later date if the results of experiments underway at Sandy Hook Laboratory should indicate that a greater or lesser number of

samples is required per station for statistical accuracy. It was also emphasized by Dr. Pearce that the sediments to be analyzed for heavy metals, chlorinated hydrocarbon and other toxic substances should be removed from the grab samples which are taken for benthic macrofauna. The subcommittee also recommended that the analyses for heavy metal and chlorinated hydrocarbons should be done for the entire sediment sample and not just the elutriates. Again the materials considered for analyses should include those species given in attachment 3 to the subject memo.

Dr. Phelps also recommended that the total body burden of contaminants should be considered for representation of the three feeding types to be found at the spoiling site as well as the alternative spoiling site. The three feeding types should include a carnivore, a deposit feeder and a suspension feeder. The body burdens should be determined for individuals prior to dumping, during the period of dumping and at a time some months after dumping is terminated. These analyses will be done in in consultation with the subcommittee with specific reference to Dr. Phelps at the EPA Laboratory in Narragansett.

Section 3.2.0 again resulted in considerable discussion. It was felt by the subcommittee that any announcement of dumping in Block Island Sound might set up a public reaction against the current proposal for dredging in the Thames River estuary. It was, therefore, suggested that rather than study a specific site in Block Island that the subcommittee originate an overall reconnaissance study to determine if there are areas within Block Island Sound that might be suitable for consideration as a spoiling site. Carl Hard felt that we should recommend bottom drifter studies to determine if materials would be carried from possible spoiling sites to beaches or into fishing areas. The subcommittee, therefore, recommended that, first of all, a contract be let to delineate those areas which are actively used for fishing in Block Island Sound. The contract research should consider areas used for sport fishing as well as for commercial fishing. Once the important fishing sites are located it would then be important to determine if the remaining areas have sufficient depth for use as spoiling sites. When this is done bottom drifters could be released at these sites to determine how water currents would transport dredging spoils dumped in these sites.

Turbidity studies would also be done in Block Island Sound. These studies would tend to "link" the studies being done in Buzzards Bay and Long Island Sound.

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August 9, 1973

The subcommittee emphasized that it is in no way recommending the use of Block Island Sound as a spoiling area, but rather that we are simply getting greater information that might allow some manager to make a rational decision at sometime in the future. Before any spoiling sites are to be considered in Block Island Sound, a study similar to that outlined in section 2.1.0 would have to be made.

Addendum B

Section 3.0, the designated dumping site, was then considered. The subcommittee recommended that bottom drifter studies be made to determine how currents move in this site.

Section 3.1.2 was amended to read that current meter placement must be done prior to beginning of disposal activities but the subcommittee did not require that the current meter studies be completed 30 days prior to commencement of disposal operations.

Section 3.1.3 received the same comments as section 2.1.6, and the subcommittee assumes that the benthic studies will be conducted in the same manner as the steps which were recommended in section 2.1.6, as amended by comments from the subcommittee. Particular attention must be paid to sampling frequencies, sampling station locations, number of samples per station, the length of sampling, analytical methods, and the physical parameters which will be measured with the biological sampling. Reference was made to the IBP handbook on benthic sampling; it was suggested that sampling procedures outlined in the benthic handbook be given consideration.

It was also recommended that the statistical analyses of data be done in a manner similar to the analyses being given to data originating from the MESA Program in the New York Bight. It was also emphasized that section 3.1.3 should be amended so that it is understood that samples will be taken prior to disposal and at quarterly intervals during the period of dredge spoiling. This is extremely important since changes in the fauna or in body burdens of heavy metals and other contaminants will be the prime indicators of adverse changes occuring because of the dredge spoiling, as was discussed by the subcommittee on 13 July 1973. If adverse effects were noted at the Thames River estuary site spoiling activities would have to be moved offshore to the alternative disposal site. Other criteria for deleterious effects of spoiling would include fish kills identified as occurring as a result of spoiling as well as significant build up of heavy metals and other contaminants in bottom sediments.

SEE Addendum C

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In section 3.2.2 the subcommittee recommended that analyses of seston be made as per recommendations in other sections of the Navy proposal. It was felt important that the seston be measured quantitatively as well as qualitatively.

It was also discussed at this time that the list of materials to be analyzed, as given in attachment 3, should also include sulfides. This would be true for analyses to be made at the dredging site, the proposed disposal site, and the alternative site.

In regard to section 3.3.0 the subcommittee recommended that Phase 3 be conducted 12 months after completion of the disposal operations rather than 6 months, as was indicated in the Navy's proposal. This will allow a greater amount of time for recolonization by benthic invertebrates. It was suggested that semi-annual reporting dates be established with reports furnished to members of the subcommittee. These reports could then be reviewed by the individual members who could then meet if the reports indicate a need for this. Comments by the subcommittee should be returned within two weeks of receipt of the semi-annual reports. The subcommittee also recognized that if the results of research should indicate any adverse change in the dredging or spoiling sites the subcommittee would be immediately alerted to the problem. The investigators should not wait until the preparation of the semi-annual reports to alert the subcommittee to any problems.

The chairman of the subcommittee then indicated that he would prepare a detailed set of notes which could be used by the Navy to amend the subject proposal. The notes would be distributed by the chairman to members of the subcommittee who will then contact the chairman and/or Mr. Carl Hard, Corps of Engineers, so that the notes can be appropriately amended. If there are no extensiva changes to be made to the subject memo, Mr. Hard will advise the Navy to amend the proposal according to the subject memo and will then issue a permit to the Navy to commence dredging activities and to make the necessary preparations for the study as delineated by the subject prposal and this memo.

Attachments:

DISTRIBUTION:
C. Hard
A. Eipper
D. Phelps
R. Meade
J. Morton
Center
Reg. Dir.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

UBJECT: Memo of August 9, 1973 DATE: August 14, 1973

ROM: Donald K. Phelps
Chief, ERB

TO: John B. Pearce
Chairman, Interagency Scientific
Advisory Subcommittee

I find that the minutes of the August 8 meeting covered in the above noted memo are basically complete with the following exceptions:

Addendum A

1) Page 4, second line from the top -- It was my understanding that Jim Gallagher, representing the Navy, emphasized that the single current meter array, plus the first set of 24 hour anchor stations would be used to justify compliance or not with the request that a minimum of three current meter arrays be maintained. If a need is generated on the basis of initial experience, then it was my understanding that the request for a minimum of three arrays of three current meters would be seriously considered.

Addendum C

2) Page 6, last sentence should be extended to include "and animals".

DKP:dm

cc: C. Hard
A. Eipper
R. Meade
J. Morton

EPA Form 1320-6 (Rev. 6-72)

REPORT INSERTION

Addendum (B)

Page 6, Para. 2 - 2nd sentence should read:

"The Sub-committee stressed the need for a more systematized experimental design for these studies. Measurements of pertinent parameters should be made at regular standardized intervals throughout the pre-dumping, dumping, and post-dumping period, at each one of the designated sampling stations. A tabular presentation of this sampling design should be presented to the Sub-committee as soon as possible, designating the sampling stations, the parameters to be measured, the frequency of sampling, and, whenever appropriate, the analytical method to be used in assessing each parameter."

DEPARTMENT OF THE NAVY
OFFICE OF THE OCEANOGRAPHER OF THE NAVY
200 STOVALL STREET
ALEXANDRIA, VA. 22332

IN REPLY REFER TO
OCEANAV:ent
Ser 883/N5
31 July 1973

From: Oceanographer of the Navy
To: Division Engineer, U. S. Army Engineers Division, New England

Subj: Environmental Monitoring Plan, Thames River Dredging Project, New London, Connecticut

Ref: (a) Interagency Scientific Advisory Subcommittee Meeting, Waltham, Massachusetts, 13 July 1973

Encl: (1) Environmental Monitoring Plan

1. Reference (a) was held to discuss the proposed Navy project for dredging in the Thames River and the dumping of dredged spoils into Long Island Sound. It was agreed that Navy would proceed to plan to dispose of dredged spoils in the New London dumping ground, and the scope of environmental studies/surveys to be conducted before, during, and after disposal operations was established.

2. In accordance with the foregoing, the Oceanographer of the Navy has developed a detailed plan which encompasses surveys at the dredge site; pre, during and post surveys at the New London dumping ground; and an investigation of two areas to identify a suitable alternative dumping site. This plan is forwarded as enclosure (1) for your approval.

3. As agreed during reference (a) Navy representatives will be available to discuss enclosure (1) in detail on 8 August 1973, if so desired.

B. E. STULTZ
By direction

Copy to:
CNO (OPs 45, 987, 43)
COMNAVFACENGCOM
NORTHNAVFACENGCOM
COMNAVOCEANO
NUSC NLON
SUBASE NLON
Dr. Robert Mead (USGS, Woods Hole)
Dr. John Pearce (Sandy Hook Marine Lab)
Dr. Alfred Eipper (Cornell University)
Dr. Donald Phelps (National Marine Water Quality Lab)

Environmental Monitoring Scheme

Thames River Dredging Project

New London, Connecticut

where are the 5 stations

1.0 Dredge Site

1.1 The dredge site study program will address the effects of dredging on the hydrology of the Thames River. Horizontal and vertical distributions of suspended solids, turbidity, salinity, temperature, and dissolved oxygen will be determined at five stations within the Thames River, with one station up-stream from the dredge site. Suspended solids will be sampled once a month. Turbidity values will be determined once a week with time series made each hour throughout one complete 24 hour tidal cycle each month. Temperature, salinity, and dissolved oxygen measurements will be taken concurrently with turbidity readings.

1.2 Aerial photographic coverage of spoils plume in the Thames River and at the disposal site will be obtained on a monthly basis.

2.0 Alternative Dump Site Investigation

Alternative dump sites will be studied to determine their suitability for use as spoil disposal in the event that disposal operations must be moved from the primary site. The investigations of the alternative dump sites will be concurrent with the primary dump site investigations. One of the alternative dump sites is a specific one mile square located approximately ten miles southeast of Block Island. This site will be studied in detail. The second alternative site is not specifically defined but is a generalized area of potential use as an alternative disposal area. Consultation with appropriate Federal and State agencies will be conducted prior to final area selection. Investigations at this second alternative area will consist of broad spectrum, reconnaissance surveys to characterize the area and locate another possible alternative disposal site.

2.1.0 First Alternative Site

2.1.1 A one time precise bathymetric survey of the area will be conducted.

2.1.2 Twenty bottom samples will be taken and analyzed, where appropriate, in accordance with the procedures of Article 227.61(c), 38 FR No. 94 of 16 May 1973. The elutriate will be analyzed for copper, lead, zinc, cadmium, sulfur and nutrients (nitrates, nitrites, phosphate and silicate). The sediments will be analyzed for biological oxygen demand, immediate dissolved oxygen demand, oil and grease, and total organic carbon.

2.1.3 Wave data will be obtained for the site from previously published data if such data exists. Otherwise, quarterly measurements of 30 day duration will be made to determine wave height, period, wave spectra and significant wave heights.

2.1.4 Current measurements will be made at the center of the proposed site with a two meter array. Measurements will be made near bottom and as near the surface as shipping conditions permit. Measurements will be made on a quarterly basis of 30 day duration.

2.1.5 Water samples will be collected quarterly at the surface, mid-depth and near bottom for ten stations evenly distributed over the proposed site. Analysis will be made for suspended solids, salinity, nutrients (nitrates, nitrites, phosphate, silicate), heavy metals (copper, lead, cadmium, zinc, mercury), dissolved oxygen, biological oxygen demand and immediate dissolved oxygen demand.

2.1.6 Biological communities will be sampled on a quarterly basis. Bottom samples will be collected at fifteen stations utilizing grab samplers. Additional bottom samples will be collected during three dredge runs. Pelagic species will be sampled on three mid-water trawls. All specimens will be sorted and identified to specie level.

2.2.0 Second Alternative Site

To site a second
~~Select~~ a

2.2.1 A general, broad area survey will be conducted ~~for the second~~ alternative area approximately four by four miles square, in Block Island Sound to determine if an additional site appropriate for disposal might be located.

2.2.2 A one time bathymetric survey will be conducted of this second alternative site.

2.2.3 Same as 2.1.2

2.2.4 Same as 2.1.3

2.2.5 Same as 2.1.4

2.2.6 Same as 2.1.5

2.2.7 Same as 2.1.6

3.0 Dump Site

The study plan for the New London dumping site will consist of a three phase program:

a. Pre-disposal measurement (Phase 1).

b. During disposal measurement (Phase 2).

c. Post-dump measurement (Phase 3).

3.1 Pre-disposal (Phase 1)

Previously collected data (June 1973) will be utilized to the maximum extent to describe the existing baselines. However, some additional measurements, discussed below, will be required.

3.1.1 Suspended Solids

Water samples to be analyzed for suspended solids will be collected at the western edge of the disposal area in the most probable path of sediment trajectory within the disposal area and out to a distance of one half mile in the north/south directions from the respective boundaries. The extension of the measurements in the selected directions is based upon the expected modal direction of transport through the area. Transmissiometer measurements will be made at one half hour intervals for 26 hours at all stations. If sufficient correlation can be established between the two measurements, future operations could omit the time consuming suspended solids determination. A time series measurement of light transmission and suspended solids will be made at the selected location to examine time variability of these properties.

3.1.2 Current measurement initiated before by five arrays of two current meters each, extending over at least 30 days will be made prior to commencement of disposal operations. The placement of the meters will be such as to define flow through and also peripheral to the disposal site. Amplitude spectra as a function of frequency will be computed and significant tidal constituents (about six) will be extracted. Based upon such an analysis, current prediction for the area could be synthesized. Expected excursion as a function of stage of the tide will be computed.

3.1.3 Bottom samples will be collected by 40 bottom grab samplers, three bottom trawls and three bottom dredges to examine the benthic fauna in the area. Transects through the dump site, and extending for at least a mile on each side of the site (exact lengths must be determined by depth and sediment size distribution) will be established and sampled. Organisms will be sorted and identified to specie level. Specie level of identification will be of value in the assessment of environmental stress resulting from the disposal operation.

3.2 During Disposal (Phase 2)

An assessment of the effects of the dredging and disposal operation will require some monitoring of the disposal site during the disposal operations. A measurement frequency of one half hour intervals for 26 hours once per month will be utilized. The frequency may change as the disposal operation progresses. The proposed measurements are suspended solids, light transmission, biological oxygen demand, currents, dissolved oxygen, immediate dissolved oxygen demand and nutrients.

3.2.1 Measurements of light transmission and suspended solids will be made to define changes in spatial distribution of these properties. A time series station (same stations occupied under 3.1.1) will be occupied. Varying stages of river run-off and meteorological conditions will be considered in the interpretation of the results.

3.2.2 Water samples will be collected for determination of biological oxygen demand and nutrients. The determination will be based on a five day incubation period at 20°C at one month intervals.

3.2.3 Supplementary current measurements of two arrays with two current meters each outside the disposal area will be made to assist in the interpretation of suspended solids and light transmission measurement. Such measurements will also allow an assessment, an up-date of such assessments, of the likely trajectories of the spoil. The probability of resuspension of spoil by near bottom currents can also be determined. Measurement will be made at mid-depth and near bottom at two locations near the dump site. Disposal operations would interfere with the operation of the mooring of current measurements instruments if they are placed in the dump site.

3.2.4 The final operation of the disposal phase will be precise bathymetric survey of the disposal site. baseline bathymetry already taken

3.3 Post disposal (Phase 3)

Phase 3 will occur approximately ~~six~~ 12 months after the completion of the disposal operation.

3.3.1 A precise bathymetric survey of the area will be conducted as part of the Phase 3 program to compare the immediate post disposal bathymetric survey to the conditions existing six months after the disposal.

3.3.2 Water samples will be collected at three depths at each of twelve selected stations within and adjacent to the dump site. The samples will be analyzed for suspended solids, salinity, dissolved oxygen, biological oxygen demand, nutrients, copper, cadmium, zinc, lead and mercury. It is planned that ten water samples will suffice.

3.3.3 Bottom samples will be collected and the elutriate analyzed for metals as listed in paragraph 3.3.2, sulfur and nutrients. Additional analyses will be made to determine biological oxygen demand, immediate dissolved oxygen demand, oil and grease, organic carbon and size distribution. Fifteen bottom samples will suffice.

4.0 Analyses and Reporting

All analyses will be performed in conformity with procedures acceptable to the Environmental Protection Agency, Region I, in accordance with existing analytical technology. A final report will be issued six months after completion of the post dump sampling period. Intermediate reports will be issued periodically and will consist of tentative findings which could affect the dredging operations.

Attendees - Corps Meeting - Wed., 8 Aug 73

John B. Pearce	Sandy Hook Lab
Bell Stearn	DEP State of Conn.
Robert E. Chase	EPA - Region I
MORGAN REES	CORPS
Frank Dayton	Corps
DONALD K. PHELPS	EPA - NATL. MAR. WAT. QUAL. LAB
Edward L. Ridley	NAVOCEANO
B.E. STULTZ	OCEANAV
CARL HARD	Corps
GERALD PESCH	EPA, NARR. R.I.
Alfred Eipper	BSF&W Cornell Univ
Jim Morton	Cornell U.
Jim Gallagher	NAVY U/W Syst Ctr, Ct
R. [illegible]	Corps

THE INITIATION OF OUR PROGRAM

AS YOU PROBABLY KNOW, THE CORPS OF ENGINEERS IS IN THE PROCESS OF LAUNCHING A FIVE YEAR THIRTY MILLION DOLLARS RESEARCH PROGRAM TO MAKE THE DREDGING PROCESS ENVIRONMENTALLY ACCEPTABLE. I WAS PLEASED TO FIND THAT AN IDEA THAT I HAD SUGGESTED A HALF DECADE AGO HAD FINALLY TAKEN ROOT, EVEN THOUGH IT STRANGELY CAME BACK TO ME AS A REQUEST TO SUBMIT PROPOSALS FOR RESEARCH. A SUBSTANTIAL PART OF THIS PROGRAM, AS WE UNDERSTAND IT, IS TO CONSIDER THE OCEAN DUMPING OF THE DREDGED MATERIAL. THE MAINTENANCE DREDGING OF THE CORPS AMOUNTS TO ROUGHLY THREE HUNDRED MILLION CUBIC YARDS OF SEDIMENT A YEAR THEREBY QUALIFYING IT AS ONE OF THE LARGEST, IF NOT THE LARGEST, OF EARTH MOVING OPERATIONS IN THE WORLD. A LARGE PART OF THIS MATERIAL IS DUMPED IN THE OCEAN AND UNTIL A HALF DECADE AGO THERE WAS LITTLE INTEREST EVINCED IN STUDYING THE ENVIRONMENTAL EFFECTS. ONE SITTING IN NEW ENGLAND AT THAT TIME, HOWEVER, COULD SEE WRITING ON THE WALL AND, CERTAINLY BY THE TIME OF THE ADVENT OF FWPCA IT WAS EVIDENT ATLEAST TO SOME OF US THAT IF WE WERE TO REMAIN IN THE DREDGING BUSINESS WE WOULD HAVE TO DEMONSTRATE RESPONSIBILITY FOR OUR ACTIONS AS THEY RELATE TO THE ENVIRONMENT. THE INCIDENT THAT SET US OFF WAS THE EMBARASSING DISCOVERY THAT OUR DESIGNATED DUMPING GROUND FOR OUR NEWLY SIGNED CONTRACT FOR DREDGING TEN MILLION CUBIC YARDS OR SO OF BOTTOM MATERIAL FROM THE PROVIDENCE RIVER WAS THE PRECISE LOCATION OF THE AMERICA'S CUP SAILBOAT RACES WHICH WERE JUST BEGINNING. THE CONTRACTOR WAS DIVERTED FARTHER OUT TO SEA DURING THE RACE PERIOD BUT GROUNDFISH DRAGGER FISHERMEN COMPLAINED THAT THEY WERE RUNNING INTO SPOIL MATERIAL WHICH FOULED THEIR GEAR. WHEN THE RACE WAS OVER THE LOBSTERMEN WHO WERE FISHING IN THE AREA OF THE ORIGINALLY DESIGNATED DUMPING GROUND AGREED SOMEWHAT RELUCTANTLY TO ACCEPT OUR USE OF AN AREA JUST NORTHEAST OF THE DESIGNATED GROUND, BUT NOT BEFORE SIX OTHER SITES HAD BEEN CONSIDERED AND REJECTED. THE CORPS ASKED THE UNITED STATES FISH AND WIDLIFE SERVICE

BUREAU OF SPORTS FISHERIES AND WILDLIFE TO NEGOTIATE A CORPS-FUNDED MONITORING PROGRAM WITH THE MARINE EXPERIMENT STATION OF THE UNIVERSITY OF RHODE ISLAND. THAT INITIAL CONTRACT WE REFER TO AS "URI PHASE I", AND IT DEVELOPED INTO CORPS-FUNDED PHASE II AND CORPS MANAGED AND FUNDED PHASE III WITH PHASE IV CURRENTLY BEING NEGOTIATED. THIS WORK PRECEDED THE NEW YORK BIGHT PUBLICITY AND ITS CONSEQUENT STUDIES BY SMITHSONIAN, SANDY HOOK AND OTHERS. SUCCEEDING STUDIES WERE MADE BY THE CORPS IN THE GREAT LAKES AND, MORE RECENTLY, BY OUR SAN FRANCISCO DISTRICT, WITH PRESENT STUDIES BEING PERFORMED BY OREGON STATE UNIVERSITY UNDER A GRANT FROM THE NATIONAL SCIENCE FOUNDATION, AND SOME OTHER WORK HAVING BEEN DONE IN CHESAPEAKE BAY.

THE NEW ENGLAND DIVISION NEVER STOPPED AFTER ITS URI PHASE I. URI WAS FOLLOWED BY STUDIES BY THE UNIVERSITY OF MAINE OFF ISLE AU HAUT, LONG ISLAND SOUND BY YALE UNIVERSITY AND THE UNIVERSITY OF CONNECTICUT, PENOBSCOT BAY BY THE MAINE DEPARTMENT OF SEA AND SHORE FISHERIES, BUZZARDS BAY BY THE NEW ENGLAND AQUARIUM AND NOW MASSACHUSETTS BAY WITH NORTHEASTERN UNIVERSITY, ALL OF THESE UNDER RESEARCH CONTRACT. ADDITIONAL FUNDING HAS GONE INTO SPECIAL STUDIES WITH THE UNIVERSITY OF MASSACHUSETTS, THE UNIVERSITY OF CONNECTICUT, AND THE NEW HAMPSHIRE DEPARTMENT OF FISH AND GAME. THESE STUDIES RELATE TO RED TIDE, INTERSTITIAL WATERS IN SEDIMENTS, THE EFFECTS OF DREDGING ON SOFT SHELL CLAM BEDS, AND WASTE WATER AND WATER SUPPLY. NOT THE LEAST OF OUR ACTIVITIES HAS BEEN A CONTINUOUS SAMPLING AND TESTING PROGRAM OF HARBOR BOTTOM MATERIALS. TO DATE WE HAVE SAMPLED THOROUGHLY THE SEDIMENTS AND OBTAINED TRANSPARENCY DATA FROM ABOUT ONE HUNDRED NEW ENGLAND HARBORS PLUS VARIOUS DUMPING GROUNDS. THE MATERIALS HAVE BEEN TESTED FOR METALS,

HYDROGEN ION CONCENTRATION, REDOX POTENTIAL, RADIOACTIVITY, CHEMICAL OXYGEN DEMAND, KJELDAHL NITROGEN, VOLATILE SOLIDS, ETC. (AS STIPULATED BY THE "OLD" EPA "GUIDELINES"). WE DID NOT SETTLE FOR THOSE GUIDELINES; WE ADDED PHYSICAL PROPERTIES SUCH AS ATTERBERG LIMITS, SPECIFIC GRAVITY, IN-PLACE DENSITY AND SIZE GRADATIONS, AND IN SOME INSTANCES BIOLOGICAL TESTS SUCH AS BACTERIA AND BIOASSAY. WE WERE NOT SATISFIED WITH THE VOLATILE SOLIDS METHOD REQUIRED BY EPA AND WE DUPLICATED OUR TESTS WITH OUR OWN METHOD WHICH DOES NOT BURN OFF THE CARBONATES AND WATER OF CRYSTALLIZATION OF THE CLAY MINERALS.

SCOPE OF WORK TO DATE

MOST OF OUR CONTRACT STUDIES TO DATE HAVE HAD A STRUCTURE OF PRE-DUMPING, MONITORING, AND POST-DUMPING OBSERVATION, HENCE SUPERFICIALLY THEY APPEAR TO FALL INTO THE CATEGORY OF MONITORING PROJECTS. ACTUALLY, HOWEVER, EACH HAS INCORPORATED DIFFERENT PROBLEMS THAT LEND THEMSELVES TO GENERAL APPLICATION. FOR EXAMPLE, THE UNIVERSITY OF RHODE ISLAND ~~WORK TO DATE~~ HAS EMPHASIZED BIOLOGICAL RECOVERY EFFECTS AS THEY RELATE TO REPOPULATION, SPECIES DIVERSITY AND DENSITY OF BENTHIC ORGANISMS. THE APPLICATION OF THESE DATA IS LIMITED, INSOMUCH AS THE DUMPING GROUND REPRESENTS SUCH A SMALL PORTION OF THE NEAR AREA OF THE CONTINENTAL SHELF AND IS CAPABLE OF PRODUCING UNDER MOST FAVORABLE CONDITIONS ONLY ONE AND ONE-HALF TONS OR SO OF BIOMASS PER YEAR. PUBLIC REACTION TO THE NEW YORK BIGHT AFFAIR RAISED THE QUESTION AS TO WHETHER DREDGE DUMPING SPREADS TOXINS LIKE A CANCER. THE PRINCIPAL VALUE OF THE REPOPULATION STUDY IS THAT IT INDICATES THAT A DUMPING GROUND WILL RECOVER AT A PREDICTABLE RATE AND REESTABLISH PREDICTABLE SPECIES AND INDEED IT MAY EVEN ATTRACT FISHING ACTIVITIES. BATHYMETRIC OBSERVATIONS OF MORE THAN TEN MILLION CUBIC YARDS OF SANDY SILT AND SILTY SAND DUMPED IN ONE HUNDRED

FEET OF WATER OFF OF AN EXPOSED COAST, IN AN ACTIVE FISHING GROUND AREA, GREATLY ALLAYED FEARS THAT THE MATERIALS WOULD BE SPREAD ALL OVER THE FISHING GROUNDS.

OTHER EXAMPLES OF SPECIFIC PROBLEMS DESIGNED TO HAVE GENERAL APPLICATION ARE TWO DIFFERENT ASSIGNMENTS IN THE AREA OF SESTON (SUSPENDED SEDIMENT PARTICLES IN THE WATER COLUMN) STUDIES GIVEN TO THE UNIVERSITY OF CONNECTICUT AND YALE UNIVERSITY AND BEING WRITTEN INTO A CONTRACT FOR STUDIES OF THE MASSACHUSETTS BAY DUMPING GROUND WHICH IS JUST BEING INITIATED. THE FORMER ARE LOOKING AT THE INORGANIC FRACTION VIA X-RAY ANALYSIS AND ELECTRON PHOTOMICROGRAPHY, WHILE THE LATTER WILL STUDY THE ORGANIC FRACTION AND RELATE IT TO NUTRIENT DISCHARGES FROM DREDGED SPOIL. OUR CONTRACTORS ARE REQUIRED TO SHARE OBSERVATIONS AND TO COLLABORATE AS MUCH AS FEASIBLE IN THEIR REPORTING, WHILE EMPHASIZING THE RELATIONSHIP BETWEEN THEIR WORK AND THE STATE OF THE ART OF DUMPING CRITERIA AS REPORTED IN ANNUAL DISPOSAL CONFERENCES THAT THE NEW ENGLAND DIVISION OF THE CORPS OF ENGINEERS HAS CONDUCTED. NONE OF THESE STUDIES HAS BEEN CONCEIVED AS A MONITORING ATTEMPT. OUR PURPOSE FOR THE PAST SEVERAL YEARS HAS BEEN ORIENTED CONSISTENTLY IN THE DIRECTION OF CRITERIA ON WHICH TO BASE DECISIONS.

DECISION MAKING ABOUT PROGRAM DESIGN

PURCHASING GOODS AND SERVICES IS ONE THING. PURCHASING IDEAS IS ANOTHER. VARIOUS PEOPLE IN THE FIELD HAVE OFFERED US MANAGEMENT SYSTEMS (WITH NO IDEA CONTENT, JUST A FRAMEWORK AND THE DESCRIPTION OF A PROCESS), OR SPECIFIC SERVICES SUCH AS SURVEYING AND TESTING PROGRAMS. NOT MUCH IN THE LINE OF IDEAS FOR INNOVATIVE PROGRAM CONCEPTION AND DEVELOPMENT, HOWEVER ARE AVAILABLE ON THE OPEN MARKET. INNOVATIVE, IMAGINATIVE SCIENTISTS WHO CONCEIVE NEW LINES OF THOUGHT CONSIDER THEIR IDEAS TO BE PROPRIETARY. THE IDEAS ARE CLOSELY GUARDED SECRETS BEFORE TEY ARE PUBLISHED IN THE PROFESSIONAL JOURNALS WITH PROPER ACCREDITATION. TO ASK FOR IDEAS IN

OPEN PLANNING IS LIKE ASKING THEM TO EMPTY THEIR POCKETBOOKS BECAUSE THE IDEAS ARE THE VERY CAPITAL THAT INSURES INSTITUTIONAL TENURE AND THE SCIENTISTS' REPUTATIONS. THIS POSES AN IMMEDIATE PROBLEM FOR A BUREAUCRAT LIKE MYSELF WHO WANTS TO GET A RESEARCH PROGRAM GOING IN A NEW, PRISTINE FIELD. CONSEQUENTLY, EVERYBODY'S PROGRAM IS APT TO LOOK LIKE THE ROUTINE, STATION DATA TYPE OF SURVEY, AND THAT IS <u>NOT</u> ENVIRONMENTAL RESEARCH.

OUR APPROACH TO THIS QUANDRY GOT OFF TO A FRUITFUL START ON FEBRUARY 23, 1971 WHEN WE HELD THE "FIRST OCEAN DISPOSAL CONFERENCE" AT WOODS HOLE, CO-CHAIRED BY DR. KETCHUM OF THE INSTITUTION THERE AND MYSELF. IT WAS FAIRLY PITHY AND MOST CRITERIA FOR OCEAN DUMPING SITES THAT ONE SEES IN THE UNITED STATES TODAY EMBODY THE SHOPPING LIST THAT WAS PREPARED BY THE VARIOUS WORKING GROUPS, ESPECIALLY DR. PETER WIEBE WHO SUMMARIZED THE BIOLOGISTS' RECOMMENDATIONS. WE HELD A SECOND CONFERENCE ON FEBRUARY 23-24, 1972 AT THE MARINE SCIENCES INSTITUTE OF THE UNIVERSITY OF CONNECTICUT, THIS TIME CO-CHAIRED BY DR. ANDREW NALWALK AND MYSELF. IT WAS A DISAPPOINTMENT. THE SECOND DAY WE INVITED THE BUREAUCRATS TO LISTEN TO THE CONCLUSIONS OF THE FIRST DAY'S WORKING GROUPS. POLITICS REARED ITS UGLIEST HEAD AND I GOT SOME PEOPLE UPSET BY MAKING A STATEMENT TO THE EFFECT THAT ACADEMICALLY ORIENTD SCIENTISTS SEEMED TO BE COPPING OUT IN THE FACE OF SOME OF THE IMMEDIATE PROBLEMS OF CIVILIZATION.

OUR MOST PRODUCTIVE CONFERENCE (OWING MUCH TO THE FIRST ONE AT WOODS HOLE) WAS THE "THIRD ANNUAL OCEAN DISPOSAL CONFERENCE" HELD AT THE MAINE DEPARTMENT OF SEA AND SHORE FISHERIES, FISHERIES RESEARCH STATION, IN WEST BOOTHBAY HARBOR ON APRIL 12-13, 1973. THE ONLY PEOPLE INVITED WERE THOSE ENGAGED IN RELEVANT RESEARCH, AND IT WAS A SMALL GROUP - NO BUREAUCRATS. DR. PEARCE, THE CHAIRMAN

OF THE SCIENTIFIC ADVISORY SUB-COMMITTEE OF THE NEW ENGLAND INTERAGENCY COORDINATING COMMITTEE ON DREDGING AND OCEAN DUMPING, REPRESENTED HIS AGENCY (NOAA): DR. DON PHELPS OF THE NORTHEAST NATIONAL MARINE WATER QUALITY LABORATORY REPRESENTED EPA (WITH OTHERS FROM WASHINGTON, THOSE WHO WERE INVOLVED IN THE NEW EPA DUMPING CRITERIA), AND DR. MEADE OF USGS AT WOODS HOLE WAS SURROGATE FOR DR. EIPPER OF CORNELL, FOR THE DEPARTMENT OF THE INTERIOR. THE GENERAL CONCLUSION SPOKE FOR DEVELOPING A MORE REGIONAL OCEANOGRAPHIC ORIENTATION TO DUMPING SITES AS OPPOSED TO SPECIFIC SITE MONITORING PROGRAMS AND OPINED THAT TOO MUCH EMPHASIS HAS BEEN PLACED ON TOXINS AS FAR AS DREDGE SEDIMENTS ARE CONCERNED.

THE NEW EPA DRAFT CRITERIA PROPOSED FOR OCEAN DISPOSAL WERE REVEALED TO US AT THIS MEETING AND, THANKFULLY, RATHER THAN CONSISTING OF A RATHER ARBITRARY SET OF FIXED NUMBERS, EMPHASIZED BIOASSAY AND SLAKING TESTS WHICH LATTER, AS I UNDERSTAND IT, EMANATED FROM CORPS PEOPLE. IT SEEMED SENSIBLE TO ME AT THAT POINT TO INCREASE OUR LABORATORY BUDGET TO EQUIP FOR THE NEW TYPES OF TESTING, BUT I INTEND ALSO TO CONTINUE OUR HARBOR SAMPLING AND TESTING PROGRAM THE OLD WAY UNTIL WE HAVE GOOD BACKGROUND DATA FOR ALL OF OUR SEVERAL HUNDRED NEW ENGLAND HARBORS. WE WILL CONTINUE THIS OVERLAPPING TYPE OF ACTIVITY FORE ABOUT FOUR MORE YEARS.

RELATED PROGRAMS

WOODS HOLE OCEANOGRAPHIC INSTITUTION, THE UNIVERSITY OF NEW HAMPSHIRE, AND THE UNIVERSITY OF RHODE ISLAND MARINE EXPERIMENT STATION HAVE BEEN STUDYING WHAT HAPPENS TO HIGHLY COMPACTED BALED MUNICIPAL WASTE WHEN DUMPED INTO THE OCEAN. THE UNH AND WHOI WORK SHOWED THE GENERATION OF HYDROGEN SULPHIDE AND

METHANE GASES, SOMEWHAT ERRATIC DISSOLVED OXYGEN EFFECTS, AND A COATING OF BACTERIA OF UNKNOWN ORIGIN. THE URI SALT WATER FLUME STUDIES SUGGESTED TO SOME EXTENT THE POSSIBLE FIXATION OF METALS BY ORGANICALLY GENERATED SULPHIDES. THIS IS AN IMPORTANT IDEA, BECAUSE THE BALES WERE HEAVILY SPIKED WITH METALS, WHILE DREDGED SPOIL MATERIALS METAL CONTENT IS MEASURED IN PARTS PER MILLION. A RECENT AD HOC COMMITTEE OF WHICH I WAS A MEMBER WAS CONVENED TO EVALUATE THE DESIRABILITY OF CONTINUING BALED WASTE RESEARCH. OUR CONCLUSION WAS THAT ONLY PROTOTYPE STUDIES ON QUANTITIES OF, SAY, A FEW THOUSAND BALES WOULD YIELD FURTHER SIGNIFICANT INFORMATION OF VALUE. MY RECOMMENDATION AND, I BELIEVE THAT OF THE COMMITTEE, WAS THAT A PRIVATE DEVELOPER SHOULD BE ENCOURAGED TO APPLY FOR A PERMIT, PERHAPS OUT OF THE CITY OF BOSTON, AND THAT THE PROTOTYPE RESEARCH SHOULD BE CONDUCTED AS THE MAJOR SUBSTANCES OF THE DEVELOPER'S ENVIRONMENTAL IMPACT STATEMEN T. WITH DUE DEFERENCE TO CONGRESS, I WOULD LIKE TO COMMENT ON THE QUALITY OF THE RESPONSES THAT WE HAVE RECEIVED ON OUR ENVIRONMENTAL IMPACT STATEMENTS. ONE OF OUR SISTER FEDERAL AGENCIES CAME RIGHT OUT AND DECLARED THAT, "THERE ARE MANY ALTERNATIVES TO DUMPING IN THE OCEAN OR ON LAND." WHAT DID THEY HAVE IN MIND? IT SEEMS THAT THEY OFFER UNACCEPTABLE ALTERNATIVES. THIS TYPE OF RESPONSE IS RAMPANT. ONE OF OUR MOST DIFFICULT PROBLEMS HAS BEEN AND IS INDIVIDUAL STATE AGENCY COORDINATION WITH RESPECT TO ALTERNATIVES. DISTRUST OF THE CORPS HAS BEEN FOSTERED FROM MANY QUARTERS, BUT WE HAVE PUT OUR MONEY WHERE OUR MOUTH IS: WE HAVE PURSUED THIS NEMESIS.

THE FUTURE OF THE PROGRAM

THERE APPEARS TO BE ENOUGH EXISTING THEORY TO ASSEMBLE A BIO-GEOCHEMICAL MODEL WHICH COULD SERVE TO PREDICT AS A WORST CONDITION THE AREAL EXTENT AND ESTIMATED AMOUNT OF INFLUENCE THAT A GIVEN DUMPING OPERATION WOULD HAVE ON BIOLOGICAL PRODUCTIVITY AND TOXIC POTENTIAL. ADDITIONAL WORK ON THE DEGREE OF DISPERSION UNDER A GIVEN SET OF OCEANOGRAPHIC VARIABLES WILL REQUIRE MODEL CONFIRMATION BY FIELD OBSERVATIONS AS WELL AS BY THEORETICAL AND APPLIED SOIL MECHANICS. I FEEL THAT OUR EMPHASIS IN FURTHER RESEARCH SHOULD BE ON THE MASS PHYSICAL PROPERTIES OF SEDIMENTS AND ON THE CHEMISTRY OF THE ORGANIC FRACTION OF THE ORGANIC SILTS THAT COMPRISE THE BULK OF MOST OF OUR HARBOR MUDS. THE RESULT OF THIS WORK, I AM CONVINCED, WILL BE TO NARROW DOWN THE POSSIBLE EXTENT OF THE DELETERIOUS CONDITION WHICH AT THIS TIME IS RELIGIOUS AND SEMANTIC TO THE POINT WHERE EVEN THE MORE SEVERE CRITICS WILL BE ABLE TO UNDERSTAND THAT THE OCEAN DUMPING OF DREDGED MATERIAL IS A PRACTICAL AND, IF MANAGED PROPERLY, ENVIRONMENTALLY ACCEPTABLE SOLUTION TO ONE OF THE MAJOR PROBLEMS OF OUR CIVILIZATION.

Reference 11

DAEN-CWO-N(1 Mar 74) 1st Ind
SUBJECT: U.S. Navy Application to Dredge in Thames River

DA, Office of the Chief of Engineers, Washington, D. C. 20314 18 Mar 74

TO: Division Engineer, New England

1. We have reviewed the data developed on the application of the U. S. Navy to dredge in the Thames River from Long Island Sound to the U.S. Naval Submarine Base in Groton, Connecticut and to utilize the New London Dumping Ground as the primary disposal site for this dredged material.

2. Included in this review has been the Environmental Impact Statement prepared by the Department of the Navy and filed with the Council on Environmental Quality on 9 January 1974, and we concur in its findings. In particular, we find that the proposed bucket dredging will minimize turbidity increases and indirect changes in water quality in the Thames River. In addition, we also find that the alternatives for disposal of the dredged material on land disposal sites, including combinations of land and sea disposal sites, use of the dredged material as agricultural soil, incineration before dumping, and containerized ocean dumping were all adequately discussed and rejected in the EIS in favor of disposal at the New London Dumping Ground. We further note that the U. S. Navy has agreed to fund a concurrent monitoring and environmental effects study to be administered by the National Oceanographic and Atmospheric Administration which may result in the use of another open water disposal site at a later date. Accordingly, we find, after comparing all of the alternative disposal sites and the environmental and economic effects which will result from the use of this dumping ground and including the consideration of the cumulative effect of all of the small marinas and commercial port dredging in Connecticut, that the New London Dumping Ground is the best site for the disposal of dredged material from this project.

3. In addition, we find that there has been ample notice and opportunity for hearing to allow everyone to express their views and submit information for use in the evaluation of this permit application. This information has revealed, in addition to the environmental impacts of this proposed activity as discussed in the Environmental Impact Statement, that a failure to dredge the 2.8 million cubic yards of material from the Thames River to allow the new and larger SSN 668 Class nuclear submarines, which are the new backbone of the submarine force essential to national security, to safely navigate to the New London Submarine Base could result in rendering this base obsolete. If the new submarines were based elsewhere, support facilities would have to be duplicated at a cost of $180 million compared to a cost of only $10 million to perform the proposed dredging. In addition, over 20,000 jobs in eastern Connecticut are dependent upon this base and the loss or reduction of a significant number of these jobs could well have a devastating impact on the economy of Eastern Connecticut. Thus, we find that the factors of national security and economic necessity are overriding in this case, and that issuance of this permit will be in the public interest.

DAEN-CWO-N(1 Mar 74) 1st Ind 18 Mar 74
SUBJECT: U. S. Navy Application to Dredge in Thames River

4. Accordingly, the Division Engineer is authorized to issue the permit subject to the conditions of the draft permit form inclosed with ENGCW-ON letter dated 12 May 1970, subject: "Permit Policy, Practices and Procedures" and the following condition:

> It is understood that the permittee, prior to commencement of work and subject to the approval of the Division Engineer, will commence a comprehensive monitoring and environmental effects study which will be funded by the permittee in an amount not to exceed $500,000. The study program will be developed in concert with representatives of Federal and State Governments having an overview of the Long Island Sound region natural resources, and will be administered by the National Oceanographic and Atmospheric Administration under an arrangement acceptable to the Division Engineer. Provisions will be made in the program for participation by a representative segment of the scientific institutions of the Long Island Sound region, for information exchange, and for integration of these studies with othersof a similar nature now under way or being planned. The permittee will designate a point of contact for purposes of coordinating scientific information and administration of this work. In the event the monitoring and environmental effects study reveals the need to change the manner in which this authorized dredging and disposal activity is being performed this permit may be summarily suspended until the terms and conditions of this permit are modified as appropriate, to effect these changes.

5. Prior to issuance of this permit, however, the Division Engineer should notify the Regional Administrator, EPA, of his intent to issue the permit after 15 days from the date of this notification pursuant to Section 103(c) of the Marine Protection, Research and Sanctuaries Act of 1972 and Section (g)(17)(iv) of the proposed revisions to ER 1145-2-303 published in the Federal Register on 10 May 1973.

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

wd all incl

JL Kelly BG USA
for J. W. MORRIS
Major General, USA
Director of Civil Works

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDOD-P-1 1 March 1974

SUBJECT: U.S. Navy Application to Dredge in Thames River

HQDA (DAEN-CWO-N)
WASH D C 20310

1. The application by the U.S. Navy for a Corps of Engineers permit for work in the Thames River, Connecticut has stirred considerable public controversy. Disposal of the dredged material at the New London Dumping Ground as proposed has brought objections from Congressman Robert H. Steele of Connecticut, Congressman Otis G. Pike of New York, and several influential citizen groups. Accordingly, the file is forwarded for review and action.

2. As required by 33 CFR 209.120, the following information is provided and supported by Inclosures 1 through 5.

a. Name of Applicant: Department of the Navy
Northern Division
Naval Facilities Engineering Command
Philadelphia, Pennsylvania 19112

b. Location of Proposed Work: Thames River from Long Island Sound to the U.S. Naval Submarine Base in Groton, Connecticut.

c. Character and Purpose of Proposed Work: Dredging of the Thames River Channel 7.5 miles from the U.S. Naval Submarine Base to Long Island Sound. The channel will be generally 500 feet wide to 36 feet below mean low water. The Navy plans to dredge two mooring basins to 38 feet below mean low water, one at the Naval Underwater Systems Center, the other at the Connecticut State Pier. Total material to be removed is approximately 2,800,000 c.y. of river bottom sediment. Disposal is proposed to be in the Connecticut portion of the New London

Dumping Ground. The purpose of this project is to assure the development of the full capabilities of the new SSN 688 class nuclear submarine to be assigned to the U.S. Navy Submarine Base in Groton.

d. Other Federal, State and Local Authorizations Required: No other authorizations or approvals are required for work to be performed by Federal agencies.

e. Public Notices, Public Hearings and Objections Raised: The public notice was issued on 26 July 1973 and two public meetings were held concerning this application. One meeting was held on 28 August 1973 at Fitch Jr. High School in Groton, Connecticut, and the second on 11 September 1973 at Greenport High School in Southold, Long Island, New York. Announcements of these meetings were released on 26 July 1973 and 22 August 1973 respectively. Announcements were sent to all Federal, State and local and other authorities and interests known to be interested in this project.

Comments raised at the public meetings and my responses are as follows:

1) Comment of Rep. Robert H. Steele and others:

Congressman Robert H. Steele, Connecticut, feels that little is known about the New London Dumping Ground despite the fact that it has been historically used as a dump site. He supports the dredging but would prefer the use of an ocean site regardless of cost, because, in his opinion, if there are harmful effects it would be better if an ocean site were used. Congressman Steele's comments were also voiced by Kenneth Stober, Representative, 42nd Conn District and Richard Stark representing the Mayor of the City of Groton.

Response: Although we have some information on the New London Dumping Ground from a study of a previous Navy dredging project of 92,500 c.y., no comprehensive study of a project of this magnitude has ever been conducted. In order to monitor the effects of both the dredging and the disposal operations a comprehensive study program is being developed. The program is designed to give early indication whether any significant adverse environmental effects result from this project. If

significant effects are found the dumping will be moved to an alternate site. The location of alternate sites will be explored under this study program. Although I anticipate some localized environmental degradation, I feel this is greatly outweighed by the public benefits to be derived from this project and by the economic advantage of using a nearby site. In addition, there is no indication whatever that any other site would result in less environmental impacts.

2) Comment of Rep. Otis G. Pike, New York, and Sen. Perry Duryea, New York State Senator:

Congressman Otis G. Pike and State Senator Perry Duryea are opposed to the dumping of this spoil anywhere in Long Island Sound because currents may carry suspended polluted spoil material into New York thereby degrading the quality of New York waters.

Response: This project may possibly cause a temporary lowering of water quality in Long Island Sound. However, the study program is being designed to detect possible serious environmental harm before it develops. From all data currently available, net movement of bed materials is minimal and away from Fisher's Island into Long Island Sound.

3) Comment of Commissioner Henry L. Diamond, New York State Department of Environmental Conservation:

Commissioner Henry L. Diamond of the New York State Department of Environmental Conservation felt that no environmental impact statement qualifying under NEPA and CEQ guidelines had been prepared. He also criticized the revised draft environmental impact statement and the fact that New York was not asked to participate in the selection of the dump site or the study program. He also stated that the proposed disposal of this dredged spoil in the New London dumping ground would subject the resources of Long Island Sound to significant potential damage. Therefore, he recommended that alternative spoil disposal areas and methods be further explored.

Response: Subsequent to the public meetings New York D.E.C. has reviewed the final EIS and is participating in development of the study program.

4) Comment of Richard B. Erickson, Southeastern Connecticut Regional Planning Agency:

Mr. Erickson supports the proposed dredging as it is of benefit to the Nation's defense and to the economy of Southeastern Connecticut. However, the agency had three questions concerning the disposal.

a) What criteria were used in selecting the New London dump site as the primary site? Was cost a consideration?

b) Once dumping is underway, how much environmental damage would be done before a problem is identified and dumping stopped?

c) Is there a danger that tidal action may eventually move the dumped spoil onto the shore of Southeastern Connecticut?

Response:

a) The New London dump site was chosen by the Corps as being the most appropriate site taking both economics and the environment into consideration.

b) NOAA scientists in conjunction with interested Federal and State agencies will determine whether significant environmental damage occurs. They will so advise the Division Engineer.

c) The Navy maintains that "the current directions and speed measured during these investigations (of the New London Disposal Site) indicate that any resuspended sediments would undergo limited net transport and probably would remain in the general vicinity of the disposal site." Also, the study program provides for continuous monitoring and allows for a halt of dredging or a change of disposal sites if adverse movement is evident.

5) General Comment made by the following:

Richard H. Miller, Long Island Fishermen's Association
Pat Denoia, Conservation Commission, Groton, Connecticut
James Homan, Councilman, Town of Southold

Ruth G. Bowers, Chairman, Ct Chapter of the Sierra Club
Mary B. Walton, President, Save our State Committee
William C. Spicer, Jr., Marina Operator, Groton
V. S. Spinella, Fishers Island Lobsterman's Association
Betty Chapman
Dr. M. Llewellyn Thatcher, Scientific Advisor to the Fishers Island Civic Association
Charles D. Hardy, Southold
Mrs. W. Dove, North Fork Audubon Society
Albert Martocchia, Town of Southold
Loraine S. Terry, President No. Fork Environmental Council, Inc.

How will the spoil be contained at the disposal site and prevented from returning to the river and/or contaminating Long Island Sound?

Response: Data obtained from study of the previous dumping indicates that any resuspended sediments would undergo limited net transport and probably would remain in the general vicinity of the disposal site. Additional study proposed for this project will provide for this continuous monitoring and allow for a halt of dredging or a change of disposal sites if adverse movement is evident.

6) _Comment of Thomas A. Parott, Fishers Island Civic Assoc., Inc., and Dr. M. Llewellyn Thatcher, Scientific Advisor to The Fishers Island Civic Assoc., Inc._

Comparison of the test dumping in 1972 of 92,500 cubic yards of spoil material with the proposed dumping of 2.8 million cubic yards is not valid.

Response: As stated in the Environmental Impact Statement, "The microscale sample is often used to predict the effects of actions at the macroscale." There really is no other way to judge until the full action is undertaken.

7) _General Comment of the following_:

Ruth G. Bowers, Chairman, Chapter of the Sierra Club
Carlton D. Hunt, Marine Sciences Institute
Steve G. Hapis
Mrs. W. Dove, North Fork Audubon Society

Richard H. Miller, Long Island Fishermen's Association
Mrs. E. E. Post, Sierra Club, Long Island Sound Task Force
Loraine S. Terry, President No. Fork Environmental Council, Inc.
Orville W. Terry, Biologist
Natalie R. Raferty, President, Fishers Island Civic Association
Virginia Bennett Moore
Mary B. Walton, Save our State Committee
William C. Spicer, Jr.
Gilbert Wagner, Environmental Manager for Pfizer, Inc.
Ronald Monroe

Neither the New London Dumping Ground nor any site in Long Island or Block Island Sound should be used because the material is polluted, under EPA guidelines, and no assurance has been given that pollution or ecological damage will not result.

Response: There will likely be local increases in pollutants at the dump site. These increases are expected to be of limited extent and to abate rapidly following cessation of dumping. The monitoring program will allow detection of adverse environmental effects at an early stage. The object of environmental consideration is not to prohibit all adverse effects, but to identify and quantify them. That knowledge is then used in the balancing process with other factors of public interest to reach a sound conclusion on a reasonable course of action.

8) Comment of V. S. Spinella, Fishers Island Lobstermen's Assoc., Inc., and Michael Ludwig, National Marine Fisheries Service, Division of Water Resources:

The spoil disposal area, the New London Dumping Ground, is primarily in New York State.

Response: The New London Dumping Ground has been shown to be approximately 80% in Connecticut State waters. All dumping will take place at a buoy which will be located within Connecticut Waters.

9) Comment of Loraine S. Terry, President, No. Fork Environmental Council, Inc.; Charles D. Hardy, Oceanographer, SUNY, Stony Brook; and Orville W. Terry, Biologist:

What are the radioactive characteristics of the spoil? The potential for transport of radioactive isotopes has not been adequately explained in the EIS.

Response: This question has been answered by the Navy in the Final Environmental Impact Statement. It states that radioactivity concentrations involved are well below allowable limits for human consumption and exposure of marine resources.

10) Comment of Vincent Spinella, Fishers Island Lobstermen's Association:

Dumping of dredged spoil from the Thames River would make the survival chances of lobsters in the disposal area "nil."

Response: A study of a Rhode Island Dump Site stated that, "The area to be influenced is small compared to the total area fished. Saila, et al (98) in a similar situation did not find evidence of lobster mortality. In fact, lobsters were among the first mobile benthic organisms to reinhabit the Rhode Island Dump Site." Further, Saila, et al, also noted, "the ability of lobsters to pass large quantities of polluted sediment through their gills with no adverse effects."

11) Comment by the following:

Jean H. Tiedke, Vice President for Community Affairs, League of Women Voters
Natalie R. Raferty, President, The Fishers Island Civic Assoc.
Virginia Bennett Moore
Lois C. Geary, Chairman, Groton Conservation Commission
Mary B. Walton, Save our State Committee
Ruth G. Bowers, Chairman, Chapter of the Sierra Club
Michael Ludwig, National Marine Fisheries Service, Division of Water Resources
Richard H. Miller, Long Island Fishermen's Association
Pat Denoia, Groton Conservation Commission
Robert J. Flanagan, Director of Real Estate, City of New London

Alternate sites or methods of disposal should be found

Response: Alternative sites and methods for disposal have been extensively considered and were found to be less desireable than controlled dumping in an already spoiled area.

12) Comment of William Spicer, Jr., and William Spicer III

There appears to be bedrock ledge in the Thames River under areas to be dredged. If bedrock is found will it be blasted and will it be dumped in the New London Dumping Ground?

Response: According to the Deputy Transportation Commissioner of the Connecticut Bureau of Waterways, there is no history of vessels grounding on ledge in the Thames River Channel. Additionally, extensive borings conducted by the Navy and the Corps did not encounter bedrock at the proposed channel depth.

13) Comment of William C. Spicer, Jr.; William Spicer III; and Charles Hardy:

The New London Dumping Ground is only 36' deep in one area, can it take all of the spoil material and still be deep enough for future use.

Response: Depth of most of the dump site ranges from 60-80 feet. The north central section is 36 feet deep. However, the site can easily absorb the 2.8 million cubic yards without reducing the depth any significant amount. The material is not expected to build up on any high points but to accumulate in low points.

14) Comment of Mrs. Betty Chapman:

Will there be any immediate bad effects such as unpleasant odors, air pollution increases, silting of beaches and/or disruption of sport and commercial fishing.

Response: None of these effects were found during operation of the previous Navy project and are not anticipated here.

15) Comments of Lois C. Geary, Chairman, Groton Conservation Commission:

a) Will we have to look forward to more dredging activity in 10-15 years and has this possibility been figured into the long term environmental cost?

b) What priorities are established between the commercial and recreational value of the Thames River and the military value?

<u>Responses</u>:

a) There has been no need in the past fifteen years for maintenance dredging of the present channel. Since the proposed channel depth will only be increased approximately five feet, it should not have a major change upon the hydrology of the channel and should not increase silting. A proposed Federal navigation project, not yet authorized, may add 1.4 million cubic yards. Whether the project will be authorized or when is unknown.

b) All demands on resource commitment are weighed to determine what uses are in the best overall public interest. Many times, as in this estuary, recreational, commercial, and military uses can satisfactorily co-exist.

c) Additional private dredging projects may occur. However, no specific projects are known at this time.

16) <u>Charles P. de Biasi, Director of Public Works, City of New London, is in favor of the project.</u>

17) <u>Comment of Lois G. Geary, Chairman, Groton Conservation Commission</u>:

Will the public have the opportunity to study information gained from the investigations of the dredging and dumping proposal?

<u>Response</u>: The results of this monitoring program and any other studies concerning the project are public information.

18) <u>Comment of Charles D. Hardy and Ruth G. Bowers, Chairman, Connecticut Chapter of the Sierra Club</u>:

The May 1973 EIS stated that the disposal site off of Rhode Island was the most environmentally suited, now the New London Site is to be used, why?

<u>Response</u>: The Rhode Island Dump Site was selected without Corps input. Our information does not support the use of the Rhode Island Dump.

19) Comment of Ruth G. Bowers, Chairman, Connecticut Chapter of the Sierra Club:

Environmental Impact Statement does not deal with bottom material, in particular, sediment size, average current velocities in the area, direction of the velocities and their full patterns.

Response: Final EIS contains information on bottom sediment. The proposed study program will gather data on currents to assess bottom sediment movements.

20) Comment of Michael Ludwig, National Marine Fisheries Service, Division of Water Resources:

Will the Navy utilize the study program. Who will make the decision to stop work if significant adverse environmental effects are found, how long will it take to stop work?

Response: Prior to issuance of a permit, a study program acceptable to the Division Engineer will be designed and provisions made for implementation. This program will include studies of environmental effects, alternative sites which might be utilized, and will provide for integration of these studies with all other study and research programs now under way. The Division Engineer will immediately suspend the permit when he considers it necessary to protect the public interest.

21) Comment of the following:

Pat Denois, Groton Conservation Commission
Captain Les Marsh
Penolope C. McPherson
Betty Chapman
Lois C. Geary, Chairman, Groton Conservation Commission
Philip Michalowski, Development Coordinator, City of New London
Vincent Spinella, Fishers Island Lobstermen's Association
Ruth G. Bowers, Chairman, Chapter of the Sierra Club
Thomas A. Parrott, Fishers Island Civic Association, Inc.

Many of the remaining comments concerned adverse environmental effects of using the New London Dumping Ground which could result. But, background information is insufficient to make any real assessment of the degree of impact.

Response: A comprehensive study program is being developed which will provide for a pre-dumping survey, continuous monitoring during dumping operations and post-dump surveys. This study will allow early detection of any adverse environmental effects. It will also provide that dumping operations will be moved to an alternate site if significant adverse effects occur.

f. Views of State and Local Authorities:

1) The Connecticut Department of Environmental Protection feels that with the expertise of the Interagency Committee on Ocean Dumping, the participating agencies, and the scientific and academic community's currently available research information, a reasonable spoil disposal location will be determined, properly controlled and utilized. They have subsequently concurred with use of the New London Dumping Ground as the primary disposal site.

2) New York State Department of Environmental Conservation has reviewed the draft environmental impact statement and is participating in development of the environmental evaluation program. It is expected that if proper controls and safeguards are included in such a program, that agency will withdraw its objections.

3) Robert H. Steele, Representative, Second Connecticut District and Kenneth Stober, Connecticut State Representative, 42nd District, approve of the project but want the spoil material disposed of outside of Long Island Sound.

4) Mayor of the City of Groton and the City Council approve of the dredging but would like the material disposed of elsewhere.

5) Mayor of the Town of Groton and the Town Council support the project as outlined in the present plans.

6) Town of Southold, New York, does not object to the dredging but expresses concern over the use of the New London Dumping Ground.

g. <u>Views of Division Engineer Concerning Probable Effect of the Work On:</u>

1) Navigation, present and prospective:

Currently there are several problems affecting navigation in New London Harbor and the Thames River. The depth of the harbor channel, 33 feet at mean low water, is not sufficient for large vessels now coming into prominent use. In addition, the approach to the State Pier is too limited in depth and area for today's traffic.

The channel in the Thames River has numerous bends, the most troublesome of which are located near the railroad bridge. Vessels approaching the bridge from the north must go slowly to align themselves with the bridge opening. But going slowly reduces their maneuverability in negotiating the bends and creates a hazard of becoming lodged crosswise in the channel or striking the bridge abutments. Other bends upstream also impede navigation and require extreme caution.

This project will result in deepening the channel to 36 feet, the approach to the State Pier to 38 feet and generally widen and straighten the channel removing some troublesome bends. Therefore, the project will have a beneficial effect on commercial and military navigation.

2) Harbor lines, if established:

No effect is anticipated.

3) Flood heights and drift.

No effect is anticipated.

4) Beach erosion or accretion:

This project should have no effect on natural sediment transport within this project area.

5) Fish and wildlife:

This project should have no long term effect on the natural resources of the areas involved. Although it is anticipated that some short term disruption of the resources will occur while work is being performed, the study program which will continuously monitor both the dredging and the disposal operation should detect environmental damage, if any, before it becomes serious.

6) Water Quality:

This project will result in a temporary lowering of water quality in the vicinity of the dredging and disposal operations. No long term effect is anticipated.

7) Aesthetics:

The proposed action will not adversely affect air and noise quality within the project areas of either the dredging or the dumping operations. Offensive gases may be liberated during the dredging operation. This effect, if it occurs, will be a short term one but possibly annoying to recreational interests such as boating in the proximity of the dredging operation. However, no odors were detected during operations at the Naval Base.

8) Ecology:

Some minor short term adverse effects are anticipated but no long range environmental impacts are expected.

9) Historic value:

No effect on historic resources is anticipated.

10) Recreation:

No effect is anticipated although caution should be used by recreational boats in the vicinity of the dredging operation.

11) Economy:

Economic benefits may be realized from reduced transportation and handling charges for deep draft receipts of petroleum and liquid chemicals. Employment and regional economy will be bolstered. Failure to carry out the project will result in a severe adverse economic effect on the region which includes a significant segment of Rhode Island. The project will also reduce the cost of the public works project planned by Corps, should that project be approved.

12) Water supply:

This project will have no effect on water supply.

13) Public interest:

Impact on various factors affecting the public interest are all favorable or neutral except for some adverse effects anticipated regarding water quality and fishery resources in the vicinity of the dredging and disposal site.

h. Other pertinent remarks: The proposed work has been determined to be essential for the national defense. The only alternative available to dredging is to locate the facility elsewhere. However, the Navy reports that duplication of shore facilities elsewhere, which already exist at Groton would cost $184,000,000. Hence, there are no reasonable alternatives to dredging.

In any case, the central theme which has emerged from extensive discussion at all levels of government and in two public meetings is:

1) There is no substantive objection offered to the dredging project

2) There is wide objection to dumping dredged sediment in Long Island Sound

3) No reasonable alternative has been proffered to dumping in the Sound.

In terms of statutory responsibilities, the Corps of Engineers designates dumping grounds within the inland waters under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. Such designation is subject to EPA review with respect to water quality standards and other specific adverse effects set forth in that Act. The New London Dumping Ground is situated on the state line, about 75% in Connecticut and 25% in New York. However, it is planned to "point dump" at a marker buoy located well within Connecticut waters.

The substance of arguments against dumping in the Sound is that sediments will cause a degradation in the quality of the surrounding water, thereby violating State and National environmental objectives and have an adverse effect on fishery resources in the

area. It is stated that such effects are not in the public interest and may cause irreparable harm to the users of Long Island Sound. The point is made that money spent for sewage treatment in estuarine waters would be negated by such action.

These statements cannot be accepted on face value without close examination of the facts supporting the action, as they are known. They are, in summary:

(1) The use of the dumping ground for similar materials has been exercised for at least 40 years. There is no record or evidence of degradation of fisheries, water quality, or recreational use of the Sound's water as a result.

(2) A limited baseline survey and observations during and after dumping of a recent lesser job tend to indicate that dumped material remains close to the point of discharge. This remains to be confirmed by more detailed observation as does the effect of the leaching elements into the water column. The absence of such confirming data is not regarded as being prohibitive to use of the dumping ground in light of the absence of any information to the contrary or any indication that some other area would result in less adverse effects on environmental resources.

i. The Final Environmental Impact Statement was submitted by the Navy to the President's Council on Environmental Quality on 7 January 1974. It stated that some adverse effects on fishery resources, infaunal and epifaunal biota, and water quality might be anticipated at the dredging site and at the disposal site. The extent of the adverse effects were generally not quantified. However, from all available data, adverse effects are likely to be minor and temporary. It stated that a study and monitoring program would be used to provide early detection of adverse environmental effects should they occur. It discussed possible alternatives to dredging and also alternative spoil disposal measures. The full impact statement is included with the file material transmitted with this report.

It should be noted most emphatically that the impact statement refers to the Scientific Advisory Subcommittee as having made the recommendation to use the New London Dumping Ground. We had previously advised Navy officials that the recommendation was that of the Division Engineer. The Scientific Advisory Subcommittee is a strictly informal group of representatives of NOAA, EPA,

U.S. Fish and Wildlife Service, NED, and various State environmental agencies, whose function is to advise the Division Engineer on scientific matters involved in ocean dumping. The decision on designating an ocean disposal site reflects the total public interest and not only scientific aspects thereof. The impact statement grossly misrepresents the function of that informal committee.

j. Conclusions:

1) Two basic conclusions were reached through review of all available data.

a) Dredging the Thames River channel is the only viable alternative to provide accomodations for the new 688 class submarines.

b) Sea dumping is the best available alternative for disposing of the dredged material.

2) Sea Dump Alternatives

a) Long Island Sound. The obvious best alternative with respect to economics and use of dredging plant facilities i.e., tow boats and scows, is to dump the material as nearby as possible. The existing New London Dumping Ground is only a few miles away and would be a likely choice. This is consistent with the intent of the Federal Water Pollution Control Act Amendments of 1972 to use existing sites wherever possible. It may also be appropriate, considering environmental concern for sport and commercial fishery areas near Fisher's Island, to use some other existing dumping ground in Long Island Sound. The only two major dump sites within range of the Thames River are Cornfield Shoal and New Haven. The New Haven site is proposed to be used for large quantities of material from Corps and private dredging projects during the next several years. The effects and area of influence of existing dumping projects are being measured and must be determined before superimposing such an additional large quantity of material. The Cornfield Shoal dumping ground has been historically used for clean sand dredged from the Connecticut River. There appears to be no sound reasoning to start dumping polluted materials

there at this time. On the other hand, the New London Dumping Ground has been extensively used previously for disposal of materials exceeding EPA ocean disposal criteria. The surrounding area remains a viable ecosystem as evidenced by the active lobster fishery between the dump site and Fisher's Island and charter fishing boats which reportedly fish extensively in the area.

b) Block Island Sound. There has been considerable discussion during the past several years regarding the wisdom of dumping any material at all into Long Island Sound. While existing data would not preclude use of a Long Island Sound Dump site, it is appropriate to examine other areas. The next adjacent body of water is Block Island Sound, Rhode Island. Limited physical data and fishery data are available from studies conducted by NED, The Naval Underwater Systems Center, and others. This would be supplemented by a reconnaissance survey of Block Island Sound in conjunction with this permit to determine which specific areas, if any, have little or no important fisheries resources and where bottom currents and topography are appropriate for sea disposal. However, even if an appropriate area were found, the political atmosphere for dumping in Rhode Island waters is dim. It is not likely that a site could be selected and used without a long confrontation with officials of Rhode Island who are adamantly opposed to the idea. Hence, if any environmentally acceptable alternative is found in Block Island Sound, due to political and pragmatic considerations, it should be pursued only as a last resort.

c) Offshore Disposal. Little is known of impacts from offshore dumping on water quality, fauna, and flora. Existing data, while far from conclusive, points to the New London Dumping Ground as an environmentally acceptable disposal site. There appears to be no justification for additional expense of going to the open ocean. However, since background data is inconclusive, this alternative will be examined in the study.

3) Considering the factors affecting the overall public interest:

a) National defense requires that the dredging be done. The only bearing it has on selection of a disposal site is that the work proceed in a timely manner. If the most

environmentally and economically suitable site cannot be used for any reason, then the most expeditious site should be used.

b) Environmental Impact. The extent of effects is largely unknown, no matter which site is selected. An extensive environmental evaluation program must be undertaken in conjunction with any dumping program. Preliminary data indicate less of an impact than many concerned people have feared. But, due to lack of data, there is little to choose between one site and another on the basis of environmental effects.

c) Economic Consideration. NED estimates the project would cost about $10,000,000 to dump at New London, $17,000,000 to dump in Block Island Sound, and somewhat more than $17,000,000 to dump at the site south-southeast of Block Island. Clearly, the most economic alternative is the New London Dumping Ground.

d) Weighing these factors to select the optimum alternative indicates that national defense calls for expediency, environmental factors are relatively the same from site to site, and economic factors point strongly to the New London Dumping Ground.

4) The conclusion is that the public interest would best be served by use of the New London Dumping Ground. However, if this area were used and was found to result in adverse environmental effects or if legal or administrative action might seriously delay carrying out the work, it would then be in the best public interest for national defense purposes to dump at an alternative site which must be determined on the basis of scientific survey and coordination of political entities involved.

5) Some procedural considerations are not yet resolved. The Environmental Protection Agency has not commented with regard to use of the New London Dumping Ground. They are waiting comments from the Connecticut Department of Environmental Protection and the New York Department of Environmental Conservation. Those agencies are waiting development of the environmental evaluation program. The Environmental Protection Agency must be given notification of intent to designate New London Dumping Ground 15 days prior to issuing the permit, if that course of action is decided upon.

NEDOD-P-1 1 March 1974
SUBJECT: U.S. Navy Application to Dredge in Thames River

k. Recommendations: I recommend that a Federal permit be granted to the U.S. Navy to perform dredging as requested and that the Corps of Engineers designates the New London Dumping Ground as the primary disposal site. Alternative dumping grounds will be explored as a condition of this permit. All standard permit conditions should apply in addition to which the following special condition should be added:

That prior to commencement of work the permittee will have received approval from the Division Engineer of a comprehensive monitoring and environmental effects study to be funded by the applicant in an amount not to exceed $500,000. The study program will be developed in concert with representatives of Federal and State Governments having an overview of the Long Island Sound region natural resources, and will be administered by a Federal Agency under an arrangement acceptable to the Division Engineer. Provision will be made in the program for participation by a representative segment of the scientific institutions of the Long Island Sound region, for information exchange, and for integration of these studies with others of a similar nature now under way or being planned. The applicant will designate a point of contact for purposes of coordinating scientific information and administration of this work.

John H. Mason
JOHN H. MASON
Colonel, Corps of Engineers
Division Engineer

Incl
as stated

U.S. DEPARTMENT COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Middle Atlantic Coastal Fisheries Center
Sandy Hook Laboratory (F161)
Highlands, New Jersey 07732

Reference 12

ate : August 19, 1974

Reply to Attn. of:

o : Members of the Interagency Policy Committee (IPC) and Scientific Advisory Subcommittee on Ocean Dredging and Spoiling (ISASODS)

ro : John B. Pearce, Subcommittee Chairman

ub : Review and Summarization of Activities of ISASODS in Connection with the Dredging and Spoiling to be Conducted by the U. S. Navy in the Thames River Estuary, Connecticut

On Wednesday, 24 July 1974, a joint meeting of IPC and ISASODS was held at the USEPA facilities, JFK Federal Building, Boston. During the meeting Mr. Richard Griffiths, Regional Director, BSFW, suggested that it would be most useful if a review and summarization of the Subcommittee's (ISASODS) activities in regard to the dredging of the Thames River Estuary could be provided to the members of the Policy Committee (IPC). It was felt that this summary could then be used in future contacts between IPC and the general citizenry and state and municipal governments.

Early in calendar year 1973, the ISASODS was established to develop a scientific overview of dredging and spoiling activities within the New England Division, U. S. Army Corps of Engineers. The Subcommittee consisted of outstanding aquatic and marine scientists working within several Federal agencies having a purview over, or interest in, marine and estuarine dredging activities; these scientists are known authorities in regard to problems concerned with aquatic pollution and environmental deterioration. During the initial and subsequent meetings of the Subcommittee it was stressed that the Subcommittee was to function in the best interests of the total citizenry and the well-being of the collective coastal environment of the New England and Middle Atlantic states.

The Subcommittee recognized that there is considerable citizen concern in regard to numerous dredging, filling and spoiling activities proposed for the coastal zone. The Subcommittee has consistently recommended that a substantial citizen involvement must be maintained in regard to any of the foregoing activities; the decisions of the Subcommittee should consider the interests and concern of the various citizen groups and state representatives involved in any single issue.

On 27 November 1973 the Subcommittee met to consider a research proposal developed by the U. S. Navy and designed to monitor the effects of the dredging and spoiling proposed to be conducted by the Navy in the Thames River Estuary. Earlier meetings between the U. S. Army Corps of Engineers, U. S. Navy and the Subcommittee had been held to brief the committee on the plan to dredge the estuary.

On 28 December 1973 the Subcommittee again convened to advise all parties to the proposed dredging and spoiling operation that the Navy cost estimate for research Plan A was too high; the Subcommittee suggested that the Navy had a responsibility to: a) redraft its proposal to incorporate the recommendations made (after 27 Nov. 73 meeting) by the States of Connecticut, New York and Rhode Island, or b) solicit an adequate proposal(s) from academia and industry, or c) transfer necessary funds to a Federal or interstate agency to develop a proposal satisfactory to all principals involved. The Subcommittee emphasized that it does not have the responsibility for drafting or revising research proposals.

Subsequently, the Subcommittee held meetings on 4 January 1974 and 20 February 1974 to again seek the views of state representatives in regard to the proposed dredging and spoiling in the Thames River Estuary and the location of alternate spoiling sites. In a memo dated 21 February 1974 the Subcommittee requested that the IPC provide guidance in regard to: a) the Navy providing funds for a monitoring study and b) the location of an alternate disposal site; the original alternative disposal site recommended by ISASODS to be south of Block Island had not been acceptable to various state agencies.

Subsequently the National Marine Fisheries Service (NMFS) was given the responsibility to develop a proposal in conjunction with scientists at the New York Ocean Science Laboratory (NYOSL), Montauk, and the University of Connecticut (UCONN) Marine Science Center, Avery Point. A meeting of the Subcommittee was held in Woods Hole on 7 March 1974 to consider the draft proposals developed by NMFS, NYOSL and UCONN. The final draft proposal for the joint research program was completed on 21 May 1974 and submitted to the Navy as Informal Report No. 25-A from the Middle Atlantic Coastal Fisheries Center, NMFS.

Throughout all its deliberations the Subcommittee recognized the need for criteria in regard to environmental deteriorations which might result as a consequence of dredging and spoiling in the Thames River Estuary and elsewhere. If the scientific research involved with monitoring studies indicated that either dredging or spoiling had an adverse

impact on the environment, and specific criteria were violated, the Subcommittee early stated that it would be mandatory that these environmentally degrading activities cease and spoiling be conducted at an alternative site. In a letter to Col. John Mason, District Engineer and Chairman, IPC, dated 9 April 1974, Mr. R. T. Norris, Regional Director, NMFS, indicated that ISASODS should, subject to the approval of the IPC, be responsible for establishing the essential criteria. Mr. Norris further stressed that any criteria established and agreed to by all parties should be made part of any permit authorizing dredging and spoiling at the Thames River Estuary sties.

The Subcommittee then engaged in a series of conference telephone calls to develop draft criteria which were reviewed by the total Subcommittee on 3 July 1974. A second draft of the criteria was promulgated on 12 July 1974 and discussed additionally during the joint meeting of IPC and ISASODS, held 24 July 1974. The criteria were subsequently publicized by an issue of News Release printed by the New England Division, CE and dated 8 August 1974.

The proposal(s) for research to be conducted at the Thames River Estuary site(s) by NMFS, NYOSL and UCONN as well as the draft criteria were reviewed by personnel representing the States of Connecticut, New York and Rhode Island. One of the principal comments made was how the criteria were to be implemented. This had been discussed by the Subcommittee on several occasions and was reviewed during the meeting if IPC and ISASODS on 24 July 1974.

The procedure to be followed was established as follows: 1) if the scientific research parties find that any item of the criteria is violated, or other substantive or unusual environmental damage is observed at the definitive dredging or spoiling sites, the Subcommittee Chairman, or his surrogate, will be contacted immediately, 2) the Chairman will convene the Subcommittee to consider the evidence and arrive at a conclusion in regard to the violation, and 3) the Subcommittee will then advise the parent IPC and that group will make a recommendation to the U. S. Navy that it alter its dredging and spoiling operations at the Thames River Estuary sites. The latter is understood to mean that the Navy would suspend operations until it is determined if the spoiling site should be moved or dredging and spoiling procedures altered so that further environmental damange is obviated.

The Subcommittee recognizes the need for urgency in the foregoing and would conduct the sequence of steps as expeditiously as possible.

Throughout all the deliberations of ISASODS the importance of the Thames River Estuary project has been recognized. The Subcommittee has recognized the urgent needs and interests of National Defense, the importance of the project to the economics and social-well-being of specific communities and the need to protect the physical environment and its living resources, including the health and well-being of the general citizenry.

Assuming that the dredging and spoiling operations are conducted in such a manner that no violations of the criteria are observed, the Subcommittee believes that a long-term (18 - 36 months) monitoring program should follow the baseline and during-operations investigations. The Subcommittee also recommends that the results of the studies should be published and made readily available to the scientific community and public as a guideline or model for future projects of a similar nature.

Further, the Subcommittee believes that alternate procedures should be considered in detail, especially in connection with proposed disposal operations involving activities in Long Island Sound and other semi-enclosed bodies of water. Is the "capping" of spoils and other solid wastes with clean sediments a feasible technique? The evidence is inconclusive and should be considered by ISASODS or other similar scientific committees. Should new spoiling or disposal sites be established outside of the Sound, for instance in the "deeps" of Block Island Sound or in the open ocean? The Subcommittee recognizes that decisions can only be made based on scientific evidence acquired through well designed research projects directed at specific geographic areas!

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